

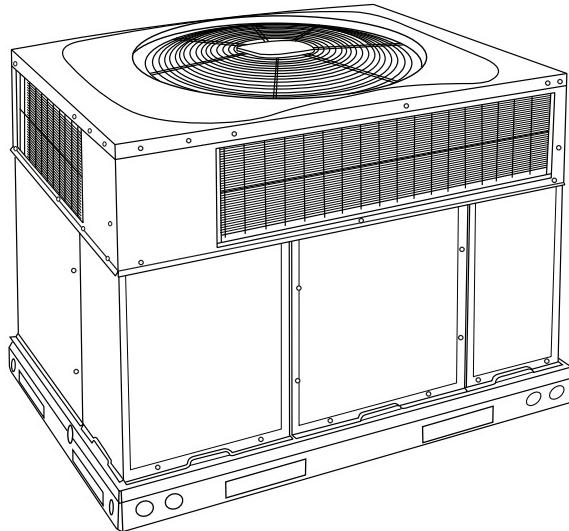
# Installation Instructions

**NOTE:** Read the entire instruction manual before starting the installation.

**NOTE:** Installer: Make sure the Owner's Manual and Service Instructions are left with the unit after installation.

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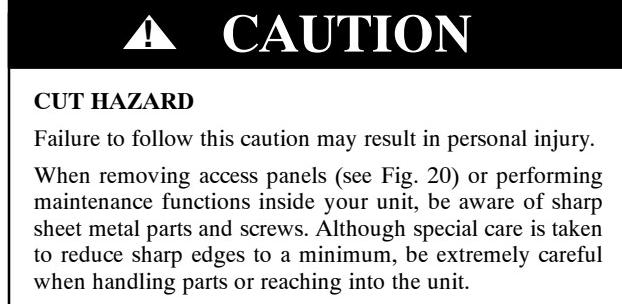
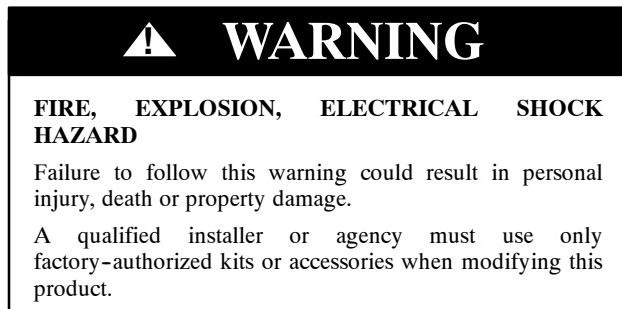
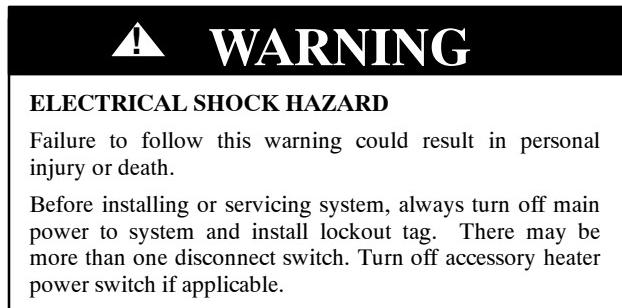
## SAFETY CONSIDERATIONS

Installation and servicing of this equipment can be hazardous due to mechanical and electrical components. Only trained and qualified personnel should install, repair, or service this equipment. Untrained personnel can perform basic maintenance functions such as cleaning and replacing air filters. All other operations must be performed by trained service personnel. When working on this equipment, observe precautions in the literature, on tags, and on labels attached to or shipped with the unit and other safety precautions that may apply.

Follow all safety codes. Wear safety glasses, protective clothing, and work gloves. Use quenching cloth for brazing operations. Have a fire extinguisher available. Read these instructions thoroughly and follow all warnings or cautions included in literature and attached to the unit. Consult local building codes, the current editions of the National Electrical Code (NEC) NFPA 70.

In Canada refer to the current editions of the Canadian electrical Code CSA C22.1.

Recognize safety information. This is the safety-alert symbol . When you see this symbol on the unit and in instructions or manuals, be alert to the potential for personal injury. Understand these signal words: DANGER, WARNING, and CAUTION. These words are used with the safety-alert symbol. DANGER identifies the most serious hazards which **will** result in severe personal injury or death. WARNING signifies hazards which **could** result in personal injury or death. CAUTION is used to identify unsafe practices which **may** result in minor personal injury or product and property damage. NOTE is used to highlight suggestions which **will** result in enhanced installation, reliability, or operation.



**INTRODUCTION**

The 604D--A heat pump is fully self-contained and designed for outdoor installation. (See Fig. 1.) Standard units are shipped in a horizontal-discharge configuration for installation on a groundlevel slab. Standard units can be converted to downflow (vertical) discharge configurations for rooftop applications.

## RECEIVING AND INSTALLATION

### Step 1 — Check Equipment

#### Identify Unit

The unit model number and serial number are stamped on the unit identification plate. Check this information against shipping papers.

#### Inspect Shipment

Inspect for shipping damage before removing packaging materials. If unit appears to be damaged or is torn loose from its anchorage, have it examined by transportation inspectors before removal. Forward claim papers directly to transportation company. Manufacturer is not responsible for any damage incurred in transit. Check all items against shipping list. Immediately notify the

nearest equipment distributor if any item is missing. To prevent loss or damage, leave all parts in original packages until installation.

If the unit is to be mounted on a curb in a downflow application, review Step 5 to determine which method is to be used to remove the downflow panels before rigging and lifting into place. The panel removal process may require the unit to be on the ground.

**IMPORTANT:** The unit must be secured to the curb by installing screws through the bottom of the curb flange and into the unit base rails. When installing large base units onto the common curb, the screws must be installed before allowing the full weight of the unit to rest on the curb. A minimum of six screws are required for large base units. Failure to secure unit properly could result in an unstable unit. See Warning near Rigging/Lifting information and accessory curb instructions for more details.

### Step 2 — Provide Unit Support

#### Roof Curb

Install accessory roof curb in accordance with instructions shipped with curb (See Fig. 4). Install insulation, cant strips, roofing, and flashing. Ductwork must be attached to curb.

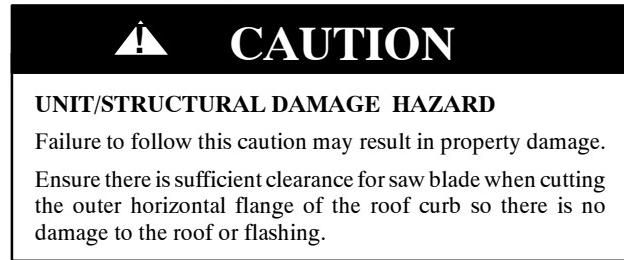
**IMPORTANT:** The gasketing of the unit to the roof curb is critical for a watertight seal. Install gasketing material supplied with the roof curb. Improperly applied gasketing also can result in air leaks and poor unit performance.

Curb should be level to within 1/4 in. (6 mm) (See Fig. 6). This is necessary for unit drain to function properly. Refer to accessory roof curb installation instructions for additional information as required.

#### Installation on older "G" series roof curbs.

Two accessory kits are available to aid in installing a new "G" series unit on an old "G" roof curb.

1. Accessory kit number CPADCURB001A00, (small chassis) and accessory kit number CPADCURB002A00, (large chassis) includes roof curb adapter and gaskets for the perimeter seal and duct openings. No additional modifications to the curb are required when using this kit.
2. An alternative to the adapter curb is to modify the existing curb by removing the outer horizontal flange and use accessory kit number CPGSKTKIT001A00 which includes spacer blocks (for easy alignment to existing curb) and gaskets for the perimeter seal and duct openings. This kit is used when existing curb is modified by removing outer horizontal flange.



#### Slab Mount

Place the unit on a solid, level concrete pad that is a minimum of 4 in. (102 mm) thick with 2 in. (51 mm) above grade (See Fig. 8). The slab should extend approximately 2 in. (51 mm) beyond the casing on all 4 sides of the unit. Do not secure the unit to the slab except when required by local codes.

### Step 3 — Provide Clearances

The required minimum service clearances are shown in Fig. 2 and 3. Adequate ventilation and outdoor air must be provided. The outdoor fan draws air through the outdoor coil and discharges it through the top fan grille. Be sure that the fan discharge does not recirculate to the outdoor coil. Do not locate the unit in either a corner or under an overhead obstruction. The minimum clearance

under a partial overhang (such as a normal house overhang) is 48 in. (1219 mm) above the unit top. The maximum horizontal extension of a partial overhang must not exceed 48 in. (1219 mm).

**IMPORTANT:** Do not restrict outdoor airflow. An air restriction at either the outdoor-air inlet or the fan discharge may be detrimental to compressor life.

Do not place the unit where water, ice, or snow from an overhang or roof will damage or flood the unit. Do not install the unit on carpeting or other combustible materials. Slab-mounted units should be at least 4 in. (102 mm) above the highest expected water and runoff levels. Do not use unit if it has been under water.

#### Step 4 — Rig and Place Unit

Rigging and handling of this equipment can be hazardous for many reasons due to the installation location (roofs, elevated structures, etc.).

Only trained, qualified crane operators and ground support staff should handle and install this equipment.

When working with this equipment, observe precautions in the literature, on tags, stickers, and labels attached to the equipment, and any other safety precautions that might apply.

Training for operators of the lifting equipment should include, but not be limited to, the following:

1. Application of the lifter to the load, and adjustment of the lifts to adapt to various sizes or kinds of loads.
2. Instruction in any special operation or precaution.
3. Condition of the load as it relates to operation of the lifting kit, such as balance, temperature, etc.

Follow all applicable safety codes. Wear safety shoes and work gloves.

#### INSPECTION

Prior to initial use, and at monthly intervals, all rigging shackles, clevis pins, and straps should be visually inspected for any damage, evidence of wear, structural deformation, or cracks. Particular attention should be paid to excessive wear at hoist hooking points and load support areas. Materials showing any kind of wear in these areas must not be used and should be discarded.



#### WARNING

##### UNIT FALLING HAZARD

Failure to follow this warning could result in personal injury or death.

Never stand beneath rigged units or lift over people.



#### WARNING

##### PROPERTY DAMAGE HAZARD

Failure to follow this warning could result in personal injury/death or property damage.

When straps are taut, the clevis should be a minimum of 36 in. (914 mm) above the unit top cover.

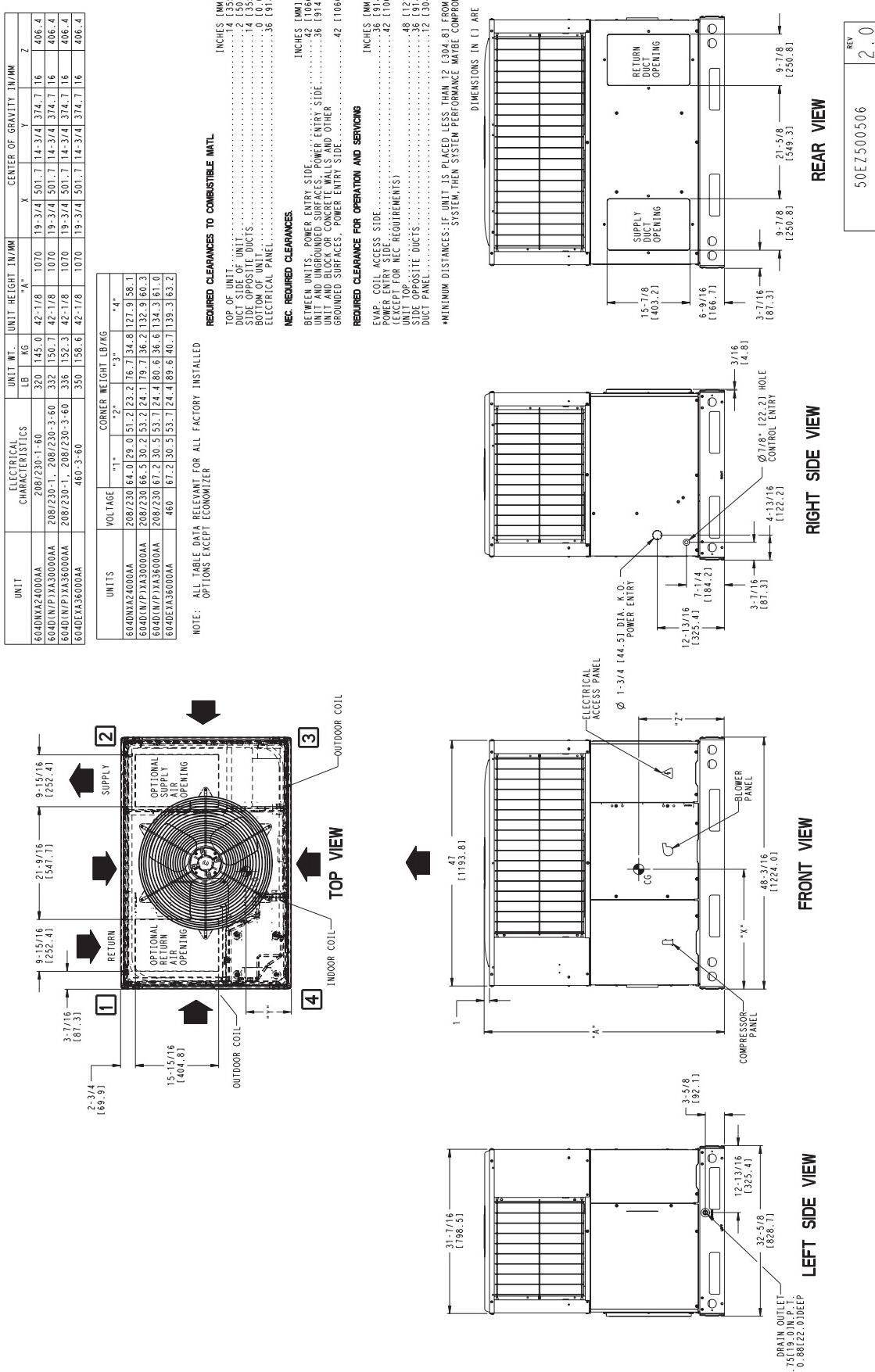
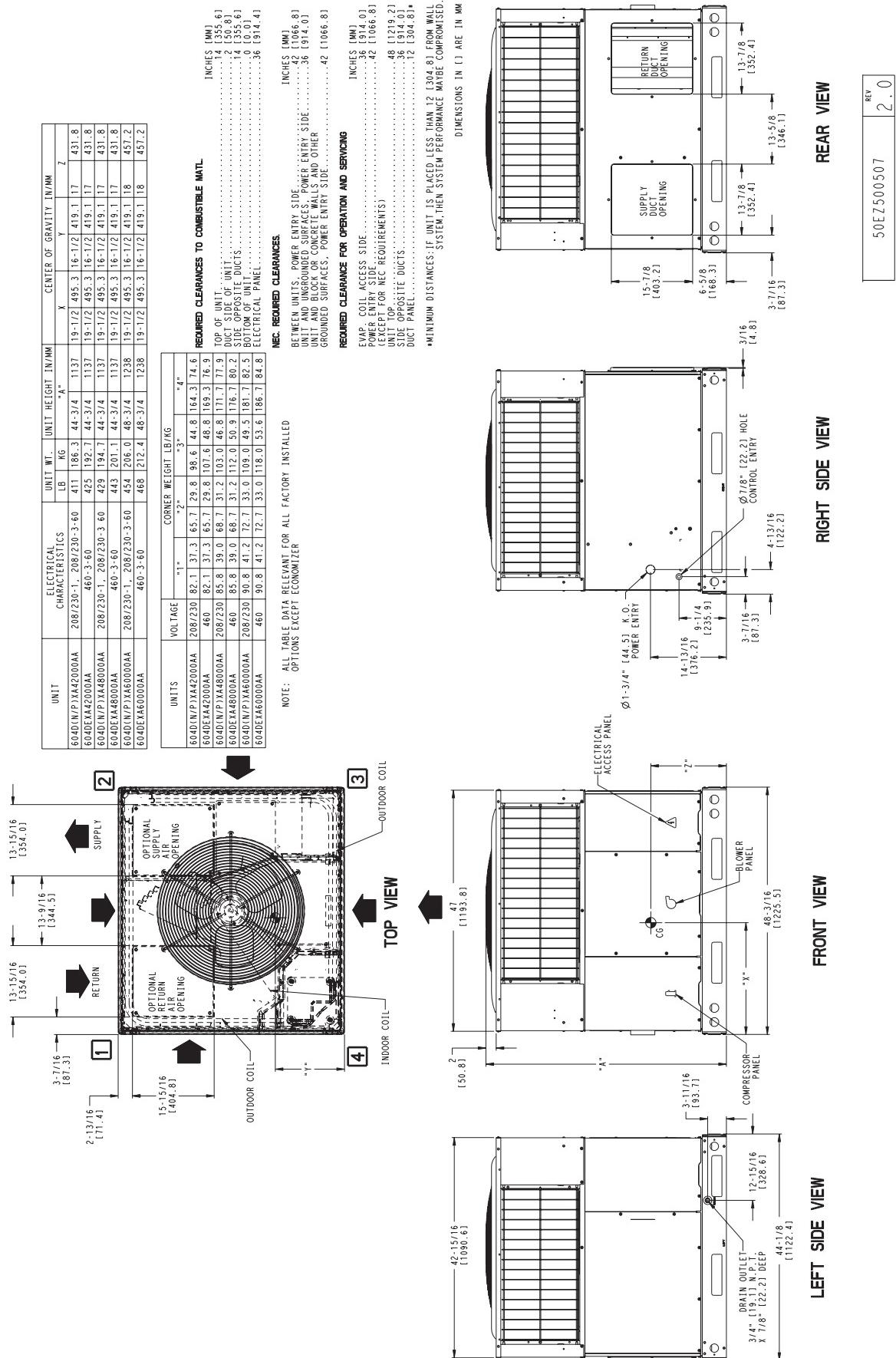


Fig. 2 - 604D--A24-36 Unit Dimensions

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50E7500506 REV 2.0

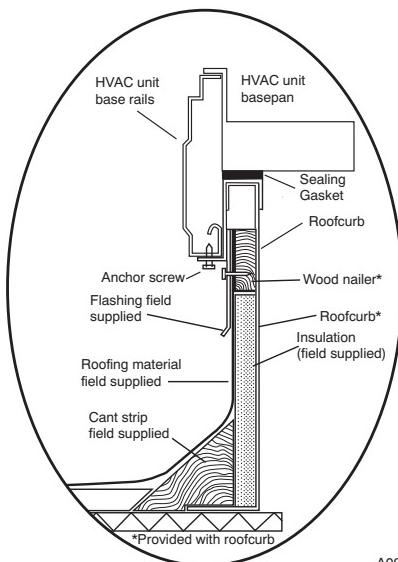
**604D--A**



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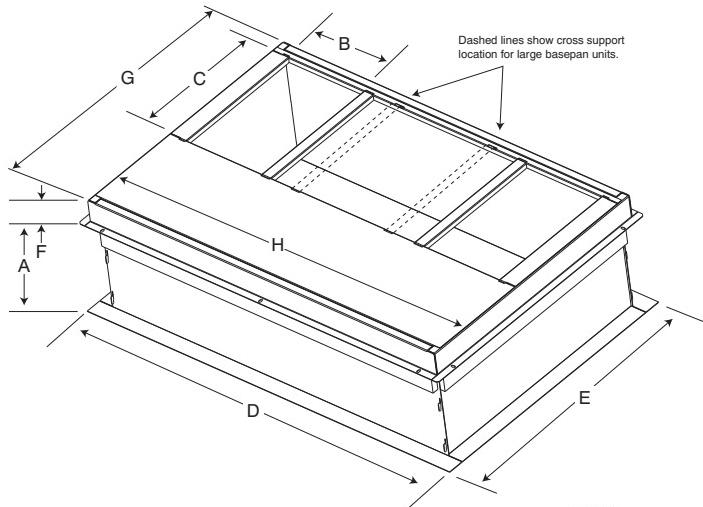
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604D--A



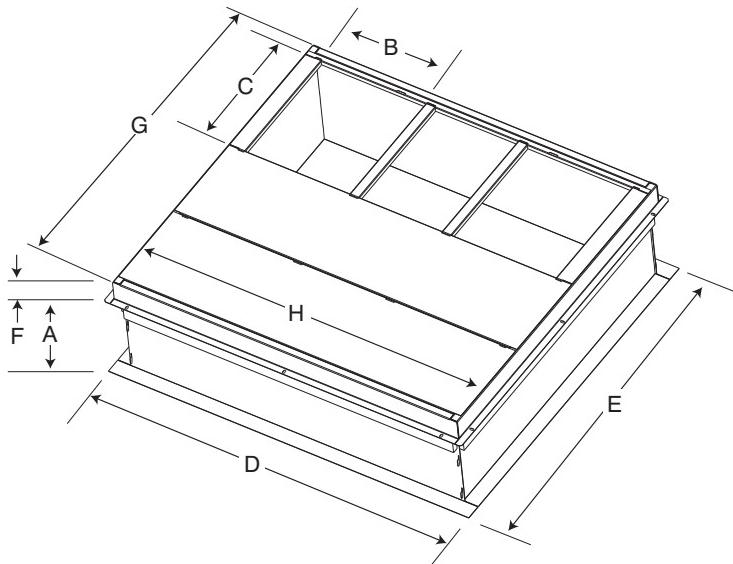
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ROOF CURB DETAIL



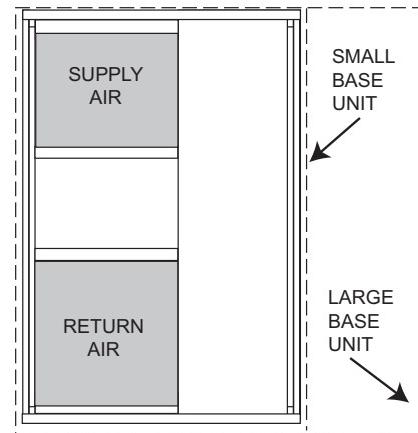
SMALL/COMMON CURB

A09413



LARGE CURB

A09415



UNIT PLACEMENT ON  
COMMON CURB

A09094

SMALL OR LARGE BASE UNIT

A09414

UNIT SIZE	CATALOG NUMBER	A IN. (mm)	B (small/common base) IN. (mm)*	B (large base) IN. (mm)*	C IN. (mm)	D IN. (mm)	E IN. (mm)	F IN. (mm)	G IN. (mm)	H IN. (mm)
Small or Large	CPRFCURB010A00	11 (279)	10 (254)	14 (356)	16 (406)	47.8 (1214)	32.4 (822)	2.7 (69)	30.6 (778)	46.1 (1170)
	CPRFCURB011A00	14 (356)					43.9 (1116)			
Large	CPRFCURB012A00	11 (279)	14 (356)						42.2 (1072)	
	CPRFCURB013A00	14 (356)								

\* Part Numbers CPRFCURB010A00 and CPRFCURB011A00 can be used on both small and large basepan units. The cross supports must be located based on whether the unit is a small basepan or a large basepan.

NOTES:

1. Roof curb must be set up for unit being installed.
2. Seal strip must be applied, as required, to unit being installed.
3. Roof curb is made of 16-gauge steel.
4. Attach ductwork to curb (flanges of duct rest on curb).
5. Insulated panels: 1-in. (25.4 mm) thick fiberglass 1 lb. density.

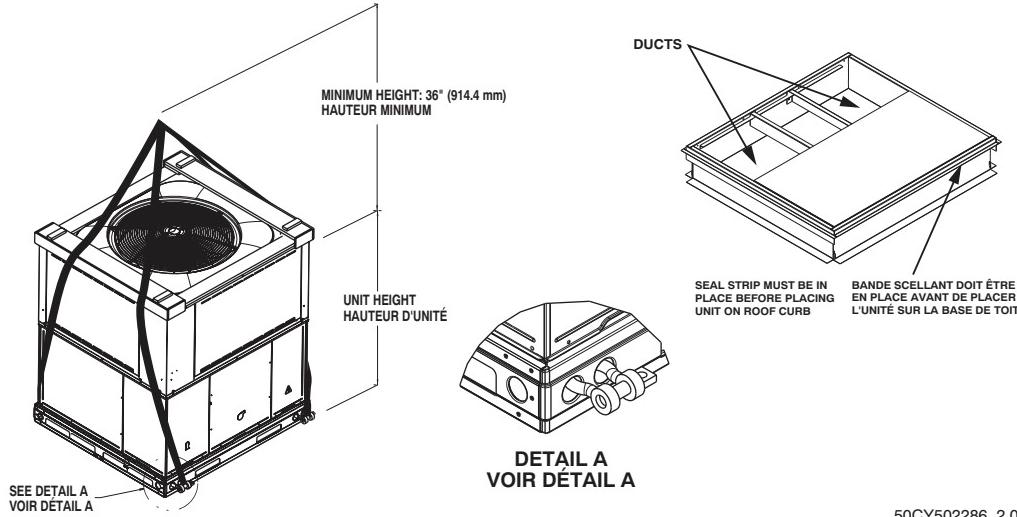
Fig. 4 - Roof Curb Dimensions

# ⚠ CAUTION - NOTICE TO RIGGERS

# ⚠ PRUDENCE - AVIS AUX MANIPULATEUR

ACCESS PANELS MUST BE IN PLACE WHEN RIGGING.  
PANNEAUX D'ACCES DOIT ÊTRE EN PLACE POUR MANIPULATION.

**Use top skid as spreader bar. / Utiliser la palette du haut comme barre de répartition**



604D -- A

50CY502286 2.0

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CORNER WEIGHTS (SMALL CABINET)						CORNER WEIGHTS (LARGE CABINET)							
Unit	24		30		36		Unit	42		48		60	
	lb	kg	lb	kg	lb	kg		lb	kg	lb	kg	lb	kg
Rigging Weight	327	148	340	154	343	156	Rigging Weight	419	190	429	195	454	206

\*For 460 Volt units add 14 lb (6.35 kg) to the rigging weight.

NOTE: See dimensional drawing for corner weights.

**Fig. 5 - Rigging Weights**

## Rigging/Lifting of Unit (See Fig. 5.)



## WARNING

### UNIT FALLING HAZARD

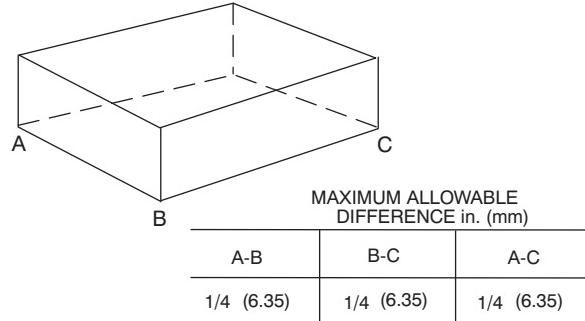
Failure to follow this warning could result in personal injury or death.

Large base units must be secured to common curb before allowing full weight of unit to rest on curb. Install screws through curb into unit base rails while rigging crane is still supporting unit.

Lifting holes are provided in base rails as shown in Fig. 2 and 3.

- Leave top shipping skid on the unit for use as a spreader bar to prevent the rigging straps from damaging the unit. If the skid is not available, use a spreader bar of sufficient length to protect the unit from damage.
- Attach shackles, clevis pins, and straps to the base rails of the unit. Be sure materials are rated to hold the weight of the unit. (See Fig. 5).
- Attach a clevis of sufficient strength in the middle of the straps. Adjust the clevis location to ensure unit is lifted level with the ground.

After the unit is placed on the roof curb or mounting pad, remove the top skid.



A07925

**Fig. 6 - Unit Leveling Tolerances**

## Step 5 — Select and Install Ductwork

The design and installation of the duct system must be in accordance with the standards of the NFPA for installation of non-residence type air conditioning and ventilating systems, NFPA 90A or residence-type, NFPA 90B and/or local codes and ordinances.

Select and size ductwork, supply-air registers, and return air grilles according to ASHRAE (American Society of Heating, Refrigeration, and Air Conditioning Engineers) recommendations. The unit has duct flanges on the supply- and return-air openings on the side of the unit.



## WARNING

### PERSONAL INJURY AND ELECTRICAL OPERATION HAZARD

Failure to follow this warning could result in personal injury or death.

For vertical supply and return units, tools or parts could drop into ductwork. Install a 90 degree turn in the return ductwork between the unit and the conditioned space. If a 90 degree elbow cannot be installed, then a grille of sufficient strength and density should be installed to prevent objects from falling into the conditioned space. Units with electric heaters require 90 degree elbow in supply duct.

When designing and installing ductwork, consider the following:

1. All units should have field-supplied filters or accessory filter rack installed in the return-air side of the unit. Recommended sizes for filters are shown in Table 1.
2. Avoid abrupt duct size increases and reductions. Abrupt change in duct size adversely affects air performance.

**IMPORTANT:** Use flexible connectors between ductwork and unit to prevent transmission of vibration. Use suitable gaskets to ensure weather tight and airtight seal. When electric heat is installed, use fireproof canvas (or similar heat resistant material) connector between ductwork and unit discharge connection. If flexible duct is used, insert a sheet metal sleeve inside duct. Heat resistant duct connector (or sheet metal sleeve) must extend 24-in. (610 mm) from electric heater element.

3. Size ductwork for cooling air quantity (cfm). The minimum air quantity for proper electric heater operation is listed in Table 2. Heater limit switches may trip at air quantities below those recommended.
4. Seal, insulate, and weatherproof all external ductwork. Seal, insulate and cover with a vapor barrier all ductwork passing through conditioned spaces. Follow latest Sheet Metal and Air Conditioning Contractors National Association (SMACNA) and Air Conditioning Contractors Association (ACCA) minimum installation standards for residential heating and air conditioning systems.
5. Secure all ducts to building structure. Flash, weatherproof, and vibration-isolate duct openings in wall or roof according to good construction practices.

### Converting Horizontal Discharge Units to Downflow (Vertical) Discharge Units



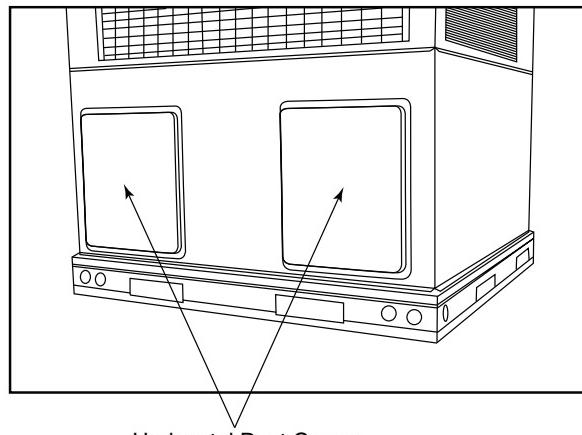
## WARNING

### ELECTRICAL SHOCK HAZARD

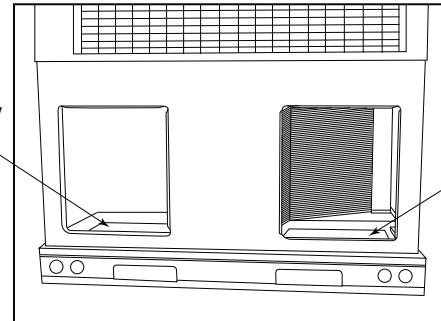
Failure to follow this warning could result in personal injury or death.

Before installing or servicing system, always turn off main power to system and install lockout tag. There may be more than one disconnect switch.

1. Open all electrical disconnects and install lockout tag before starting any service work.
2. Remove horizontal (metal) ductcovers to access vertical (downflow) discharge duct knockouts in unit basepan. (See Fig. 7.)
3. After completing unit conversion, perform all safety checks and power up unit.



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Fig. 7 - Supply and Return Duct Openings



## CAUTION

### PROPERTY DAMAGE HAZARD

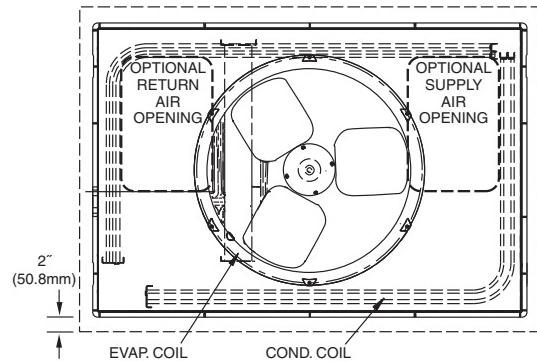
Failure to follow this caution may result in property damage.

Collect ALL screws that were removed. DO NOT leave screws on rooftop as permanent damage to the roof may occur.

To remove downflow return and supply knockout covers, break front and right side connections tabs with a screwdriver and hammer. Push cover down to break rear and left side tabs.

**NOTE:** These panels are held in place with tabs similar to an electrical knockout. Reinstall horizontal duct covers (Fig. 7) shipped on unit from factory. Insure openings are air and watertight.

**NOTE:** The design and installation of the duct system must be in accordance with the standards of the NFPA for installation of non residence-type air conditioning and ventilating systems, NFPA 90A or residence-type, NFPA 90B; and/or local codes and ordinances.



A07926

Fig. 8 - Slab Mounting Detail

## Step 6 — Provide for Condensate Disposal

**NOTE:** Ensure that condensate-water disposal methods comply with local codes, restrictions, and practices.

The 604D--A units dispose of condensate through a 3/4 in. NPT female fitting that exits on the compressor end of the unit. Condensate water can be drained directly onto the roof in rooftop installations (where permitted) or onto a gravel apron in ground level installations. Install a field-supplied 2-in. (51 mm) condensate trap at end of condensate connection to ensure proper drainage. Make sure that the outlet of the trap is at least 1 in. (25 mm) lower than the drain-pan condensate connection to prevent the pan from overflowing. Prime the trap with water. When using a gravel apron, make sure it slopes away from the unit.

If the installation requires draining the condensate water away from the unit, install a field-supplied 2 -in. (51mm) trap at the condensate connection to ensure proper drainage. Condensate trap is available as an accessory or is field-supplied. Make sure that the outlet of the trap is at least 1 in. (25 mm) lower than the unit drain-pan condensate connection to prevent the pan from overflowing. Connect a drain trough using a minimum of field-supplied 3/4-in. PVC or field-supplied 3/4-in. copper pipe at outlet end of the 2-in. (51 mm) trap. (See Fig. 10) Do not undersize the tube. Pitch the drain trough downward at a slope of at least 1 in. (25 mm) every 10 ft (3 m) of horizontal run. Be sure to check the drain trough for leaks. Prime the trap at the beginning of the cooling season start-up.

## Step 7 — Install Electrical Connections



### CAUTION

#### UNIT COMPONENT DAMAGE HAZARD

Failure to follow this caution may result in damage to the unit being installed.

1. Make all electrical connections in accordance with NEC NFPA 70 (latest edition) and local electrical codes governing such wiring. In Canada, all electrical connections must be in accordance with CSA standard C22.1 Canadian Electrical Code Part 1 and applicable local codes. Refer to unit wiring diagram.
2. Use only copper conductor for connections between field-supplied electrical disconnect switch and unit. DO NOT USE ALUMINUM WIRE.
3. Be sure that high-voltage power to unit is within operating voltage range indicated on unit rating plate. On 3-phase units, ensure phases are balanced within 2 percent. Consult local power company for correction of improper voltage and/or phase imbalance.
4. Do not damage internal components when drilling through any panel to mount electrical hardware, conduit, etc.



### WARNING

#### ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

The unit cabinet must have an uninterrupted, unbroken electrical ground. This ground may consist of an electrical wire connected to the unit ground screw in the control compartment, or conduit approved for electrical ground when installed in accordance with NEC,NFPA 70 National Fire Protection Association (latest edition) (in Canada, Canadian Electrical Code CSA C22.1) and local electrical codes.

## High-Voltage Connections

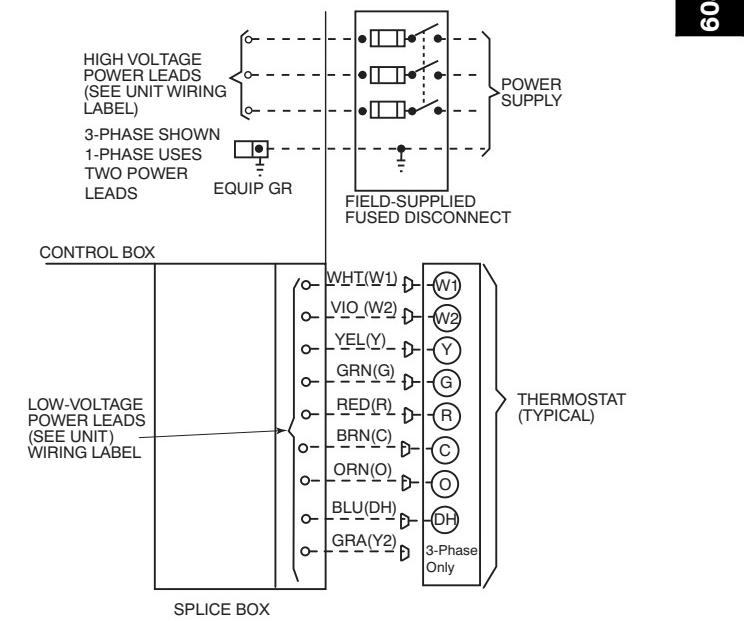
The unit must have a separate electrical service with a field-supplied, waterproof disconnect switch mounted at, or within sight from the unit. Refer to the unit rating plate, NEC and local codes for maximum fuse/circuit breaker size and minimum circuit amps (ampacity) for wire sizing.

The field-supplied disconnect may be mounted on the unit over the high-voltage inlet hole when the standard power and low-voltage entry points are used. See Fig. 2 and 3 for acceptable location. Remove high voltage knockout.

See unit wiring label (Fig. 11-13) and Fig. 9 for reference when making high voltage connections. Proceed as follows to complete the high-voltage connections to the unit.

Single phase units:

1. Run the high-voltage (L1, L2) and ground lead into the control box.
2. Connect ground lead to chassis ground connection.
3. Locate the black and yellow wires connected to the line side of the contactor.



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Fig. 9 - High- and Control-Voltage Connections

4. Connect field L1 to black wire on connection 11 of the compressor contactor.
5. Connect field wire L2 to yellow wire on connection 23 of the compressor contactor.

Three-phase units:

1. Run the high-voltage (L1, L2, L3) and ground lead into the control box.
2. Connect ground lead to chassis ground connection.
3. Locate the black and yellow wires connected to the line side of the contactor.
4. Connect field L1 to black wire on connection 11 of the compressor contactor.
5. Connect field wire L3 to yellow wire on connection 13 of the compressor contactor.
6. Connect field wire L2 to blue wire from compressor.

604D --A

## Special Procedures for 208-V Operation



# WARNING

## ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Before installing or servicing system, always turn off main power to system and install lockout tag. With disconnect switch open, move black wire from transformer (3/16 in.) terminal marked 230 to terminal marked 200. This retaps transformer to primary voltage of 208 vac.

## Control Voltage Connections

**NOTE:** Do not use any type of power-stealing thermostat. Unit control problems may result.

Use no. 18 American Wire Gage (AWG) color-coded, insulated (35°C minimum) wires to make the control voltage connections between the thermostat and the unit. If the thermostat is located more than 100 ft (30.5 m) from the unit (as measured along the control voltage wires), use no. 16 AWG color-coded, insulated (35° C minimum) wires.

## Standard Connections

Locate the eight (nine on 3-phase) low voltage thermostat leads in 24 volt splice box. See Fig. 9 for connection diagram. Run the low-voltage leads from the thermostat, through the control wiring inlet hole grommet (Fig. 2 and 3), and into the low-voltage splice box. Provide a drip loop before running wires through panel. Secure and strain relief all wires so that they do not interfere with operation of unit. A gray wire is standard on 3-phase units for connection to an economizer.

If an accessory electric heater is installed, low voltage leads from heater must be connected to factory supplied control leads from Indoor Fan Board P4 connector. Factory wires are provided for electric heat staging W1 and W2 (W2 and W3 on IFB). If room thermostat has only one stage of supplemental heat, connect white and violet wires shown in Fig. 9 to second stage heat field wire.

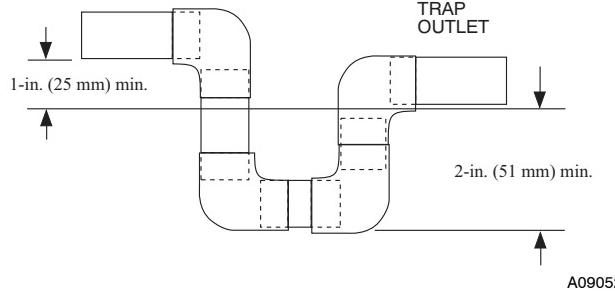
Some electric heaters have four control wires (plus common wire). Consult unit wiring diagram and electric heater wiring diagram for additional details.

## Transformer Protection

The transformer is of the energy-limiting type. It is set to withstand a 30-second overload or shorted secondary condition. If an overload or short is present, correct overload condition and check for blower fuse on Interface Fan Board. Replace fuse as required with correct size and rating.

## Accessory Electric Heaters Installation

Electric heaters may be installed with the 604D--A units per instructions supplied with electric heater package. See unit rating plate for factory-approved electric heater kits.



**Fig. 10 - Condensate Trap**

**Table 1 – Physical Data - Unit 604D--A**

UNIT SIZE	604D--A24	604D--A30	604D--A36	604D--A42	604D--A48	604D--A60
<b>NOMINAL CAPACITY (ton)</b>	2	2.5	3	3.5	4	5
<b>SHIPPING WEIGHT‡ (lb) (kg)</b>	327 148	340 154	343 156	419 190	429 195	454 206
<b>COMPRESSOR QUANTITY</b>				1		
<b>TYPE</b>				SCROLL COMPRESSOR		
<b>REFRIGERANT</b>				R-410A		
<b>Refrigerant (R-410A) Quantity (lb) Quantity (kg)</b>	8.3 3.8	10.2 4.6	7.9 3.6	10.0 4.5	9.6 4.4	12.3 5.6
<b>METERING DEVICE ID</b>				TXV		
<b>ORIFICE OD (in.) (mm)</b>	0.032 (2) .81	0.035 (2) .89	0.037 (2) .94	0.038 (Left OD Coil) 0.040 (Right OD Coil) .97/.02	0.046 (2) 1.2	0.052 (2) 1.3
<b>OUTDOOR COIL</b> Rows... Fins/in. face area (sq. ft.)	2...21 11.9	2...21 11.9	2...21 11.9	2...21 13.6	2...21 13.6	2...21 17.5
<b>OUTDOOR FAN</b> Nominal Airflow (CFM) Diameter Motor HP (RPM)	2000 24 1/5 (810)	2700 24 1/5 (810)	2700 24 1/5 (810)	3100 26 1/5 (810)	3100 26 1/5 (810)	3500 26 1/5 (810)
<b>INDOOR COIL</b> Rows... Fins/in. face area (sq. ft.)	3...17 3.7	3...17 3.7	3...17 3.7	3...17 4.7	3...17 4.7	3...17 5.7
<b>INDOOR BLOWER</b> Nominal Cooling Airflow (CFM) Size (in.) (mm)	800 10x10 254x254	1000 10x10 254x254	1200 11x10 279x254	1400 11x10 279x254	1600 11x10 279x254	1800 11x10 279x254
<b>Motor (HP)</b>	1/2	1/2	3/4	3/4	1.0	1.0
<b>HIGH-PRESSURE SWITCH (psig)</b> Cutout Reset (Auto)				650±15 420±25		
<b>LOSS-OF-CHARGE/LOW-PRESSURE SWITCH</b> (Liquid Line) (psig) Cutout Reset (Auto)				20±5 45±10		
				20±5 45±10		
<b>RETURN-AIR FILTERS*†</b> throwaway (in.) (mm)	20x20x1 508x508x25	20x24x1 508x610x25		24x30x1 610x762x25		24x36x1 610x914x25

**604D -- A**

\*Required filter sizes shown are based on the larger of the AHRI (Air Conditioning, Heating and Refrigeration Institute) rated cooling airflow or the heating airflow velocity of 300 ft/minute for throwaway type or 450 ft/minute for high-capacity type. Air filter pressure drop for non-standard filters must not exceed 0.08 IN. W.C.

† If using accessory filter rack refer to the filter rack installation instructions for correct filter size and quantity.

‡ For 460 volt units, add 14 lb (6.4 kg) to the weight.

**Table 2 – Minimum Airflow for Reliable Electric Heater Operation (CFM)**

SIZE	604D--A24	604D--A30	604D--A36	604D--A42	604D--A48	604D--A60
AIRFLOW (CFM)	800	1025	1250	1400	1710	1800

# CONNECTION WIRING DIAGRAM

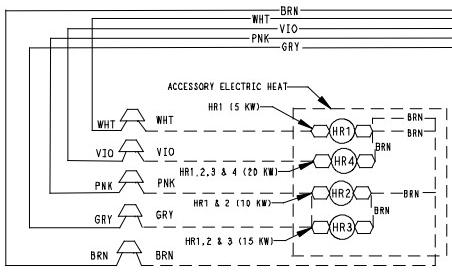
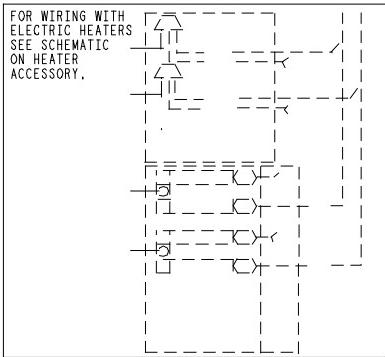
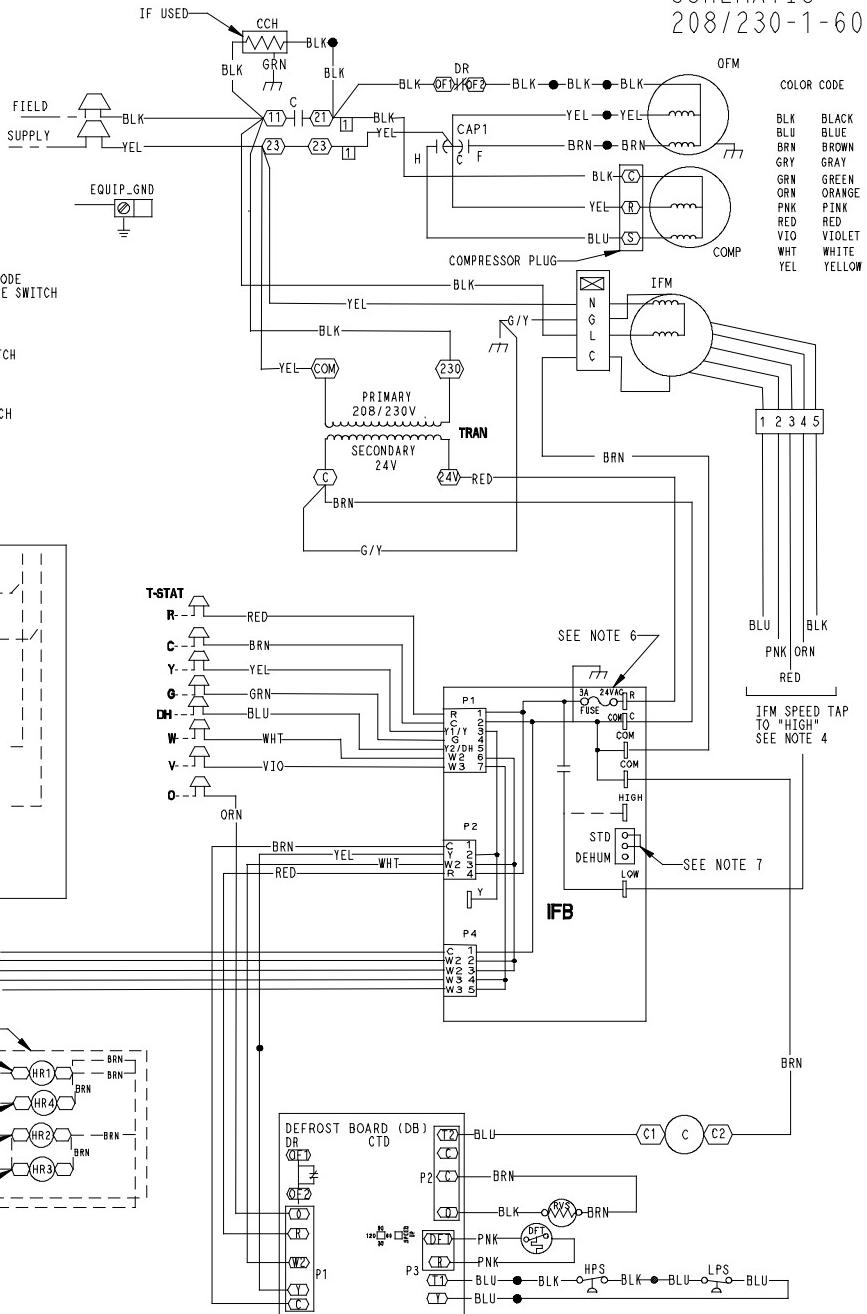
**DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING**

SCHEMATIC  
208/230-1-60

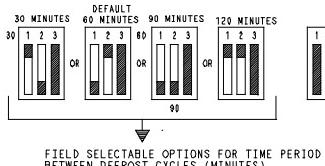
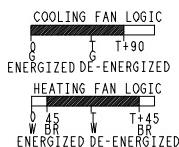
- NOTES:**
1. IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH THE SAME WIRE OR ITS EQUIVALENT.
  2. SEE PRICE PAGES FOR THERMOSTATS.
  3. USE 15 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
  4. SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT. INDOOR FAN MOTOR PLUGS - "DO NOT DISCONNECT UNDER LOAD".
  5. CCH NOT USED ON ALL UNITS.
  6. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003.
  7. UNIT FACTORY-SHIPPED IN STD MODE.

**LEGEND**

△ FIELD SPLICE	COMP	COMPRESSOR MOTOR
□ TERMINAL (MARKED)	DB	DEFROST BOARD
○ TERMINAL (UNMARKED)	DEHUM	DEHUMIDIFICATION MODE
● SPLICE (IF USED)	DFT	DEFROST TEMPERATURE SWITCH
◇ SPLICE (MARKED)	DR	DEFROST RELAY
— FACTORY WIRING	EQUIP	EQUIPMENT
— FIELD CONTROL WIRING	GND	GROUND
— FIELD POWER WIRING	HPS	HIGH PRESSURE SWITCH
— ACCESSORY OR OPTIONAL WIRING	HR	HEATER RELAY
— TO INDICATE COMMON POTENTIAL ONLY:	IFB	INDOOR FAN BOARD
NOT TO REPRESENT WIRING	IFM	INDOOR FAN MOTOR
C	LPS	LOW PRESSURE SWITCH
CONTACTOR	OFM	OUTDOOR FAN MOTOR
CAP 1	RVS	REVERSING VALVE
CCH	STD	STANDARD MODE
CRANK CASE HEATER	TRAN	TRANSFORMER
	T-STAT	THERMOSTAT



**DIP SWITCH SETTINGS**



SPEED UP  JUMPERED TEST PINS (USE METAL OBJECT) FIELD SPEED-UP CYCLE

- 1) MOMENTARILY SHORT PINS AND RELEASE TO BYPASS COMPRESSOR OFF DELAY.
- 2) SHORT FOR 5+ SEC. AND RELEASE FOR FORCED DEFROST.
- 3) PERMANENT SHORT WILL BE IGNORED.

DEFROST WILL TERMINATE IN 30 SEC. IF DFT OPEN.  
DEFROST WILL TERMINATE NORMALLY IF DFT IS CLOSED.

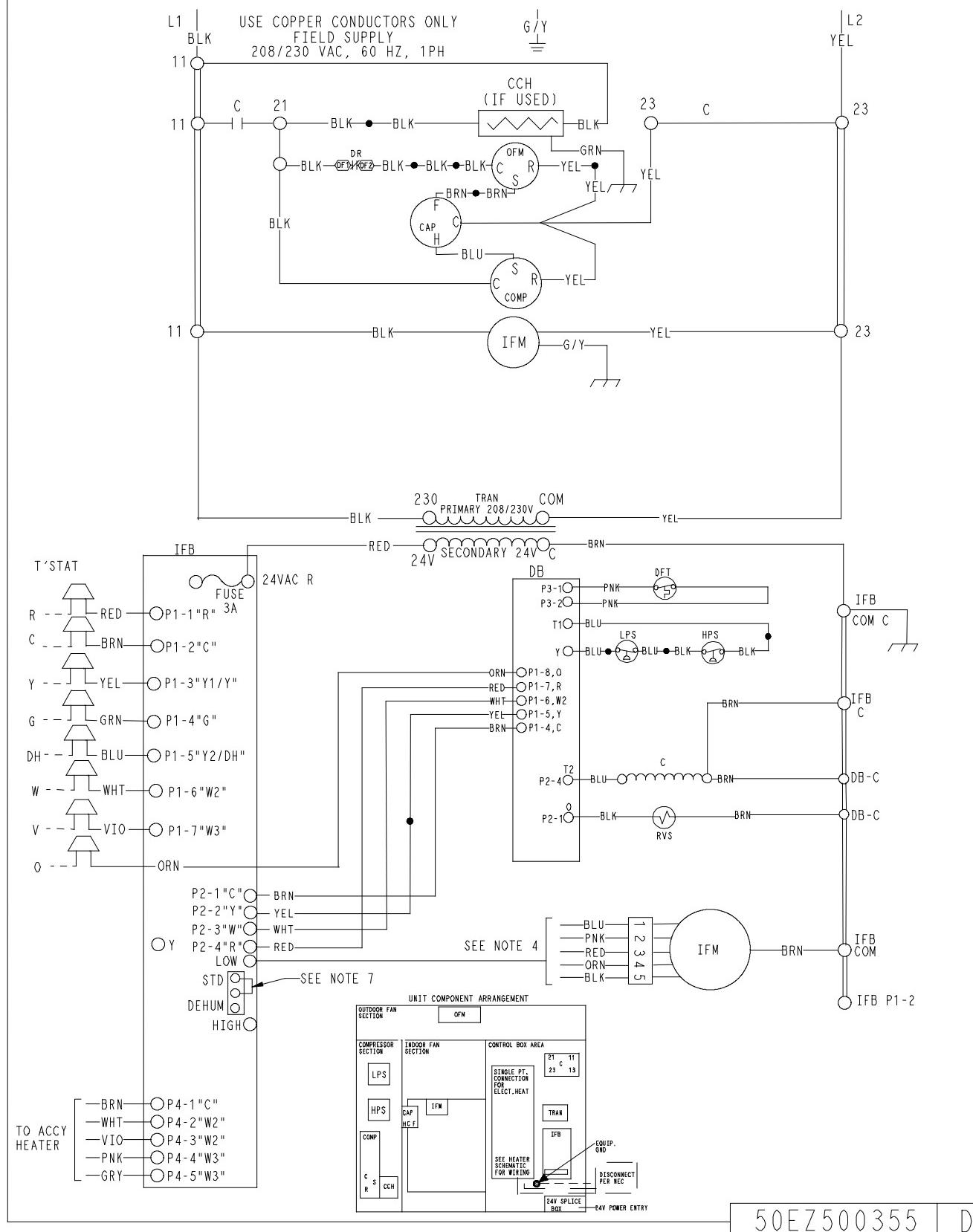
THE COMPRESSOR WILL SHUT OFF FOR 30 SEC. ON DEFROST INITIATION AND TERMINATION IN THE "QUIET SHIFT" ON POSITION

**Fig. 11 - Connection Wiring Schematics 208/230-1-60**

A10197

## LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



**Fig. 11 Cont. - Ladder Wiring Schematics 208/230-1-60**

# CONNECTION WIRING DIAGRAM

## DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

**NOTES:**

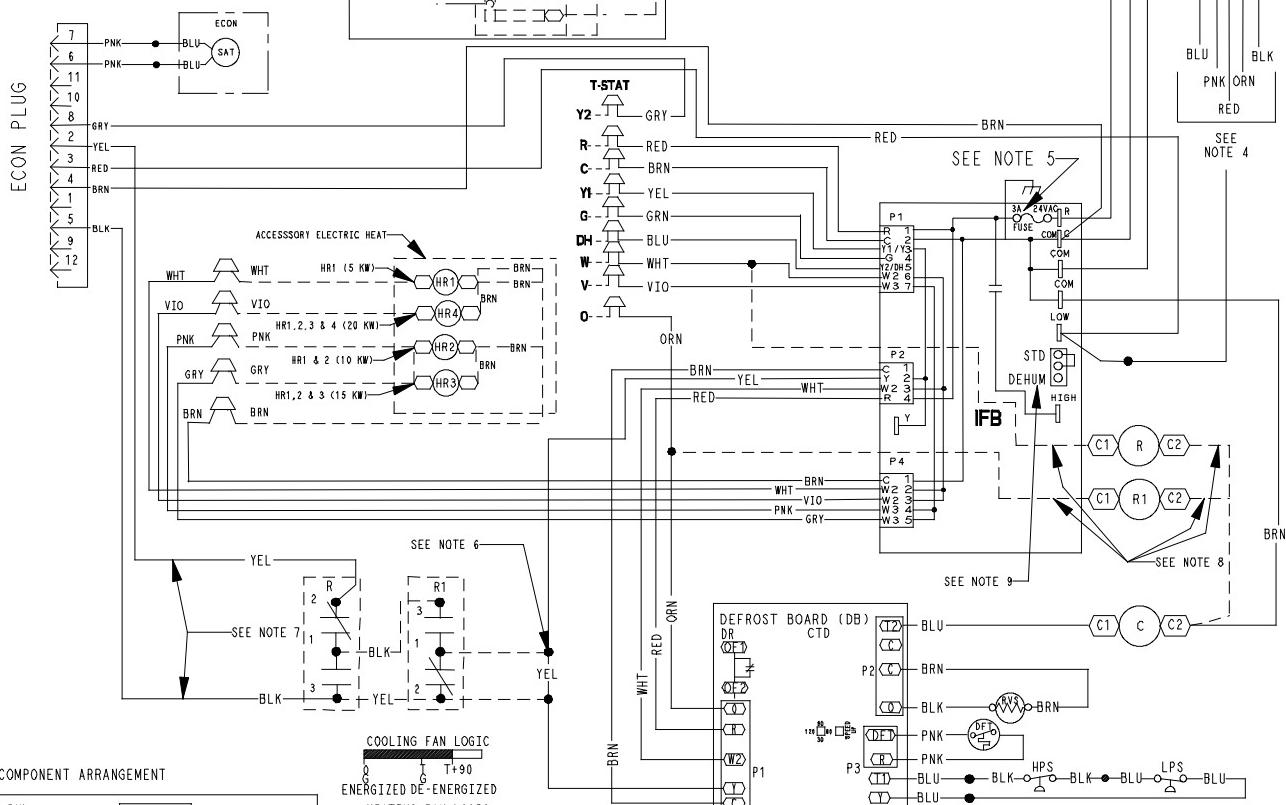
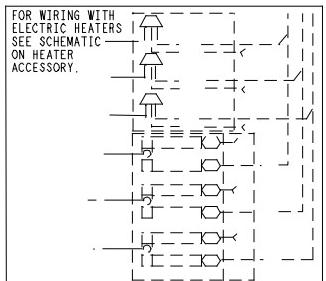
1. IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH THE SAME WIRE OR ITS EQUIVALENT.
2. SEE PRICE PAGES FOR THERMOSTATS.
3. USE 75 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
4. SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS
5. PLUG THE OUTDOOR FAN MOTOR PLUGS "DO NOT DISCONNECT UNDER LOAD"
6. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257083
7. REMOVE YELLOW SPLICE WIRE WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED AND CONNECT TO RELAY R1 AS SHOWN.
8. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, CONNECT THE YELLOW AND BLACK WIRES TO RELAY R AS SHOWN. RELAY KIT REQUIRED WITH ECONOMIZER AND HEAT PUMP/DUAL FUEL UNITS.
9. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, INSTALL WIRES AS SHOWN ONTO THE COILS OF RELAY R AND RELAY RT.
10. DEHUM FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED. UNIT FACTORY-SHIPPED IN STD MODE.

**SCHEMATIC**  
208/230-3-60

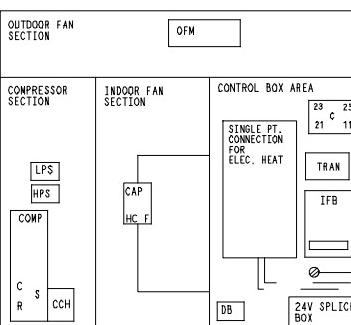
COLOR CODE	
BLK	BLACK
BLU	BLUE
BRN	BROWN
GRY	GRAY
GRN	GREEN
ORN	ORANGE
PNK	PINK
RED	RED
VIO	VIOLET
WHT	WHITE
YEL	YELLOW

### LEGEND

△ FIELD SPLICE	GND	GROUND
○ TERMINAL (MARKED)	HPS	HIGH PRESSURE SWITCH
● TERMINAL (UNMARKED)	HR	HEATER RELAY
□ SPLICE (IF USED)	IFB	INDOOR FAN BOARD
— FACTORY WIRING	IFM	INDOOR FAN MOTOR
-- FIELD CONTROL WIRING	LPS	LOW PRESSURE SWITCH
— FIELD POWER WIRING	OFM	OUTDOOR FAN MOTOR
--- ACCESSORY OR OPTIONAL WIRING	RVS	REVERSING VALVE
TRAN	TRANSFORMER	
T-STAT	TERMOSTAT	
C	CONTACTOR	
CAP 1	CAPACITOR, COMP	
CCH	CRANK CASE HEATER	
COMP	COMPRESSOR MOTOR	
DB	DEFROST BOARD	
DH	DEHUMIDIFICATION MODE	
DEHUM	DEHUMIDIFICATION MODE	
DFT	DEFROST TEMPERATURE SWITCH	
DR	DEFROST RELAY	
ECON	ECONOMIZER	
EQUIP	EQUIPMENT	



### UNIT COMPONENT ARRANGEMENT



### DIP SWITCH SETTINGS



FIELD SELECTABLE OPTIONS FOR TIME PERIOD  
BETWEEN DEFROST CYCLES (MINUTES)

SPEED UP  JUMPERED TEST PINS (USE METAL OBJECT) FIELD SPEED-UP CYCLE

- 1) MOMENTARILY SHORT PINS AND RELEASE TO BYPASS COMPRESSOR OFF DELAY.
- 2) SHORT FOR 5+ SEC. AND RELEASE FOR FORCED DEFROST.
- 3) PERMANENT SHORT WILL BE IGNORED.

DEFROST WILL TERMINATE IN 30 SEC. IF DFT OPEN.  
DEFROST WILL TERMINATE NORMALLY IF DFT IS CLOSED.

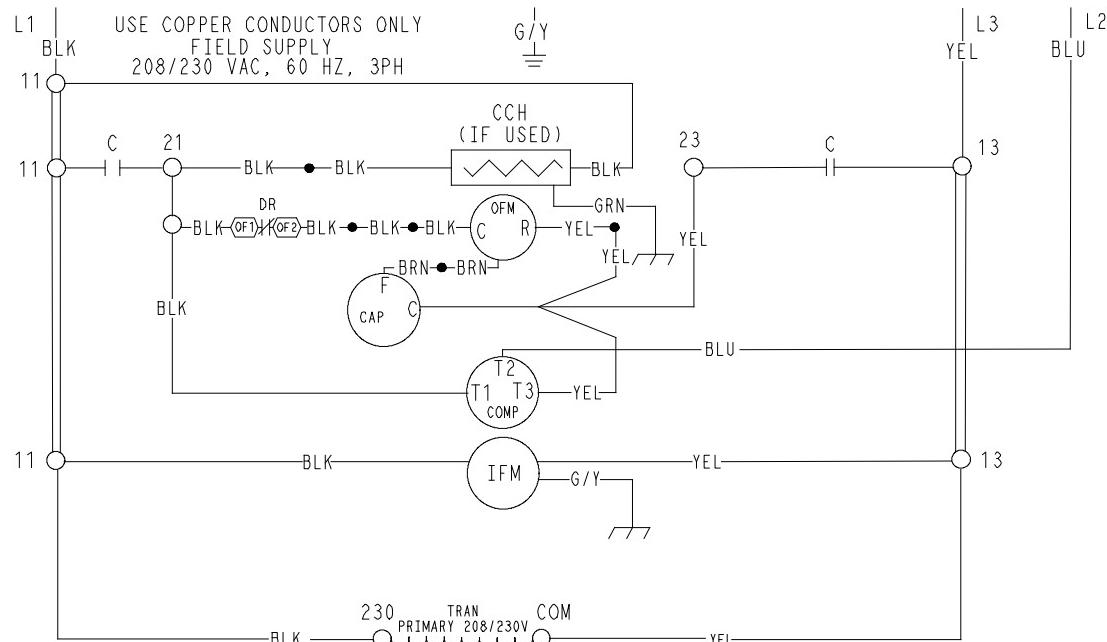
THE COMPRESSOR WILL SHUT OFF FOR 30 SEC. ON DEFROST INITIATION AND TERMINATION IN THE "QUIET SHIFT" ON POSITION

A10194

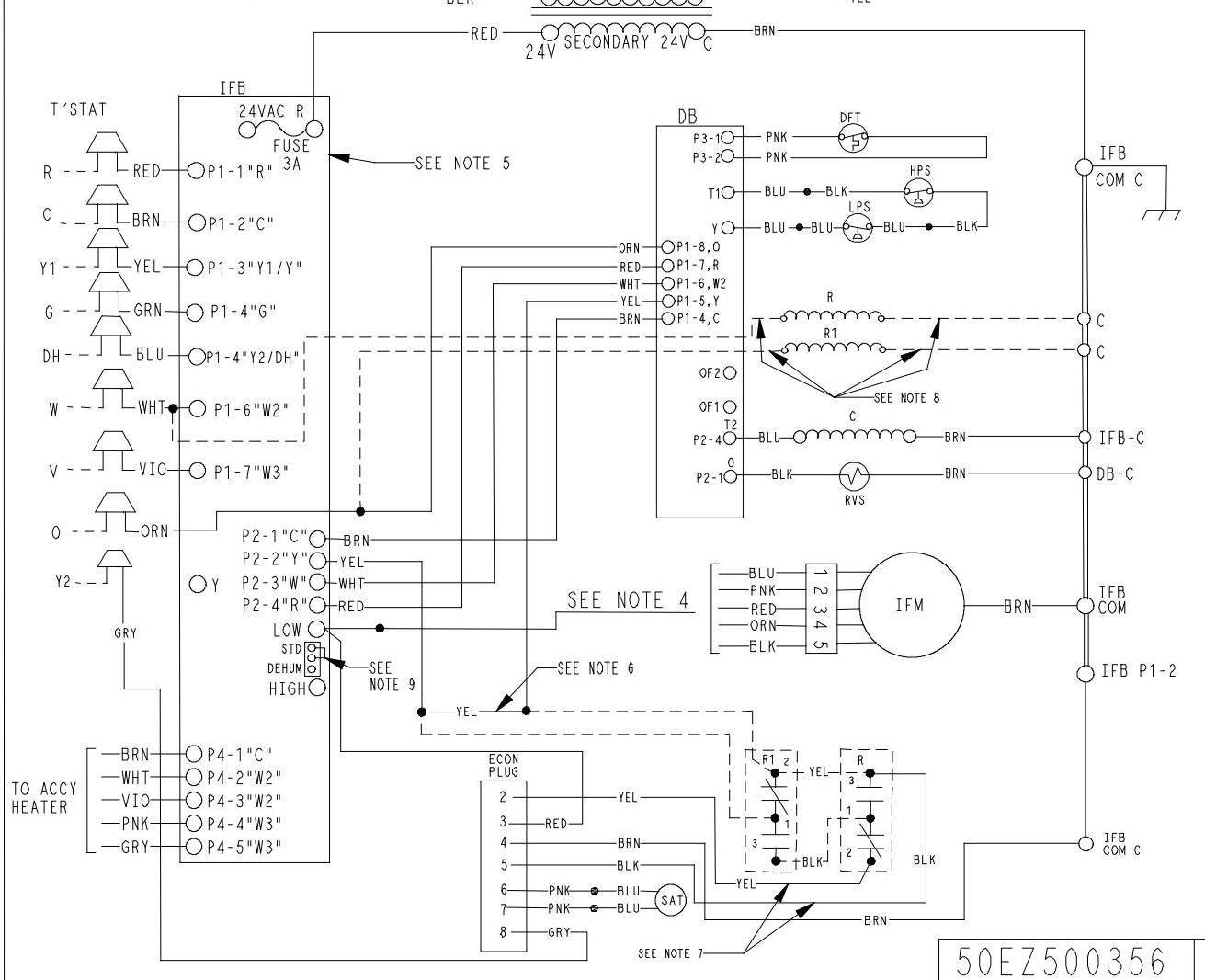
**Fig. 12 - Connection Wiring Schematics - 208/230-3-60**

## LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



604D--A



50EZ500356

A10194

**Fig. 12 Cont. - Ladder Wiring Schematics - 208/230-3-60**

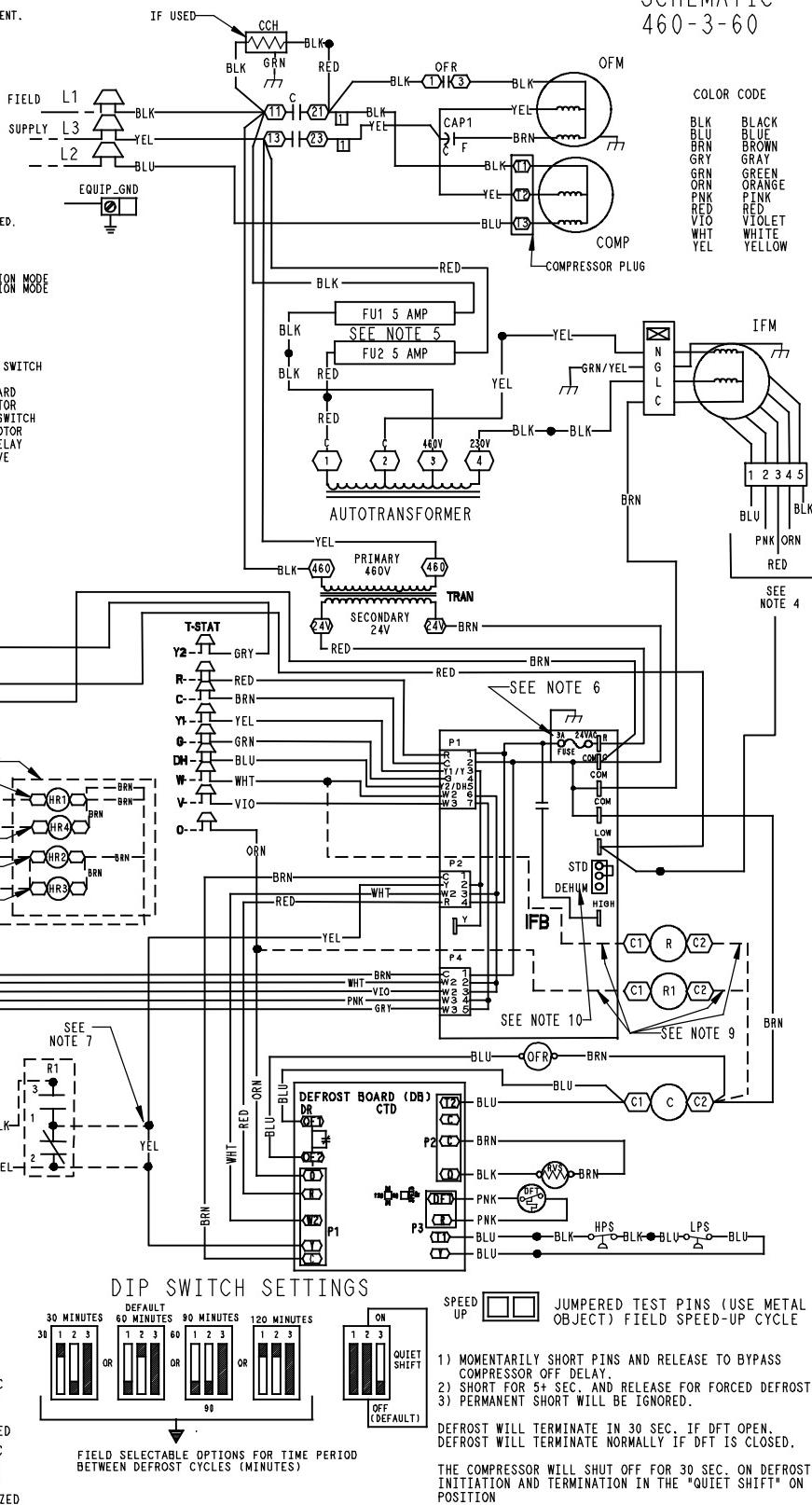
## CONNECTION WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

- NOTES:

  1. IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED,  
THEY MUST BE REPLACED WITH THE SAME WIRE OR ITS EQUIVALENT
  2. SEE PRICE PAGES FOR THERMOSTATS.
  3. USE 75 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
  4. SEE INSTALLATION INSTRUCTIONS  
FOR PROPER HEATING AND COOLING CONNECTIONS  
FOR THERMOSTAT POWER OR FAN MOTOR PLUGS  
DO NOT DISCONNECT UNDER LOAD
  5. THESE FUSES ARE MANUFACTURED BY COOPER BUSSMANN,  
P/N FNO-R-5.
  6. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003.
  7. REMOVE YELLOW SPLICE WHEN ECONOMIZER AND ECONOMIZER  
RELAYS ARE USED AND CONNECT TO RELAY R AS SHOWN.
  8. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED,  
CONNECT THE YELLOW AND BLACK WIRES TO RELAY "R" AS  
SHOWN. RELAY KIT REQUIRED WITH ECONOMIZER AND HEAT  
PUMP/DUAL FUEL UNITS.
  9. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, INSTALL  
WIRES AS SHOWN ONTO THE COILS OF RELAY R AND RELAY R1.
  10. DEHUM FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED.  
UNIT FACTORY-SHIPPED IN STD MODE.

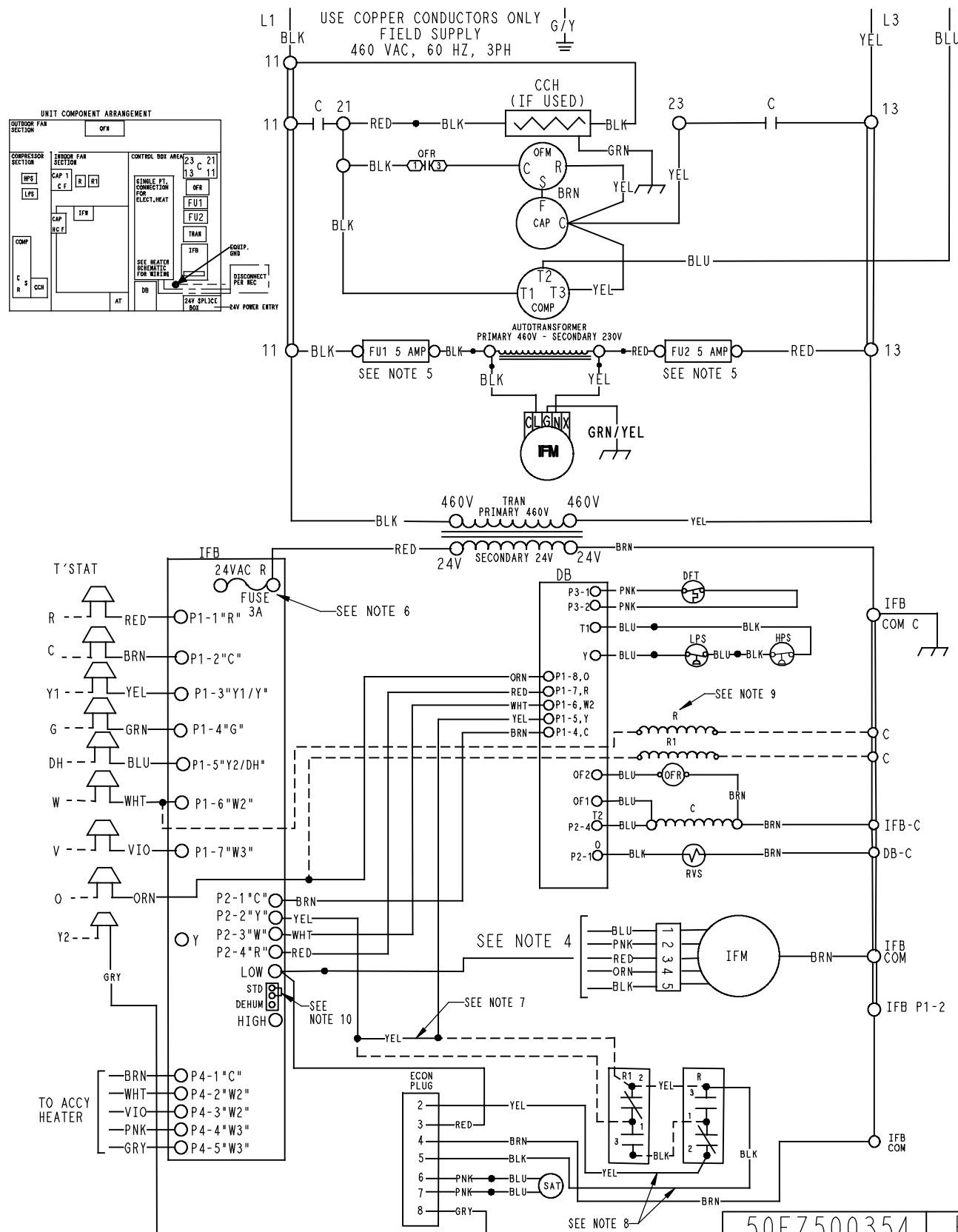
**SCHEMATIC**  
**460-3-60**



**Fig. 13 - Connection Wiring Diagram 460-3-60**

# LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



604D --A

Fig. 13 Cont. - Ladder Wiring Diagram 460-3-60

A10195

## PRE-START-UP



# WARNING

### FIRE, EXPLOSION, ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury, death or property damage.

1. Follow recognized safety practices and wear protective goggles when checking or servicing refrigerant system.
2. Relieve and recover all refrigerant from system before touching or disturbing compressor plug if refrigerant leak is suspected around compressor terminals.
3. Do not remove compressor plug until all electrical sources are disconnected and tagged.
4. Never attempt to repair soldered connection while refrigerant system is under pressure.
5. Do not use torch to remove any component. System contains oil and refrigerant under pressure.  
To remove a component, wear protective goggles and proceed as follows:
  - a. Shut off electrical power to unit and install lockout tag.
  - b. Relieve and reclaim all refrigerant from system using both high- and low-pressure ports.
  - c. Cut component connecting tubing with tubing cutter and remove component from unit.
  - d. Carefully unsweat remaining tubing stubs when necessary. Oil can ignite when exposed to torch flame.

604D--A

Use the Start-Up Checklist supplied at the end of this book and proceed as follows to inspect and prepare the unit for initial start-up:

1. Remove all access panels (see Fig. 20).
2. Read and follow instructions on all DANGER, WARNING, CAUTION, and INFORMATION labels attached to, or shipped with, unit.
3. Make the following inspections:
  - a. Inspect for shipping and handling damages such as broken lines, loose parts, disconnected wires, etc.
  - b. Inspect for oil at all refrigerant tubing connections and on unit base. Detecting oil generally indicates a refrigerant leak. Leak-test all refrigerant tubing connections using electronic leak detector, or liquid-soap solution. If a refrigerant leak is detected, see following Check for Refrigerant Leaks section.
  - c. Inspect all field and factory-wiring connections. Be sure that connections are completed and tight. Ensure wires do not touch refrigerant tubing or sharp sheet metal edges.
  - d. Inspect coil fins. If damaged during shipping and handling, carefully straighten fins with a fin comb.
4. Verify the following conditions:
  - a. Make sure that outdoor-fan blade is correctly positioned in fan orifice.
  - b. Make sure that air filter(s) is in place.
  - c. Make sure that condensate drain pan and trap are filled with water to ensure proper drainage.
  - d. Make sure that all tools and miscellaneous loose parts have been removed.
5. Each unit system has 2 Schrader-type ports, one low-side Schrader fitting located on the suction line, and one high-side Schrader fitting located on the compressor discharge line. Be sure that caps on the ports are tight.

## START-UP

### Checking Cooling and Heating Control Operation

Start and check the unit for proper control operation as follows:

- (1.) Place room thermostat SYSTEM switch or MODE control in OFF position. Observe that blower motor starts when FAN mode is placed in FAN ON position and shuts down when FAN MODE switch is placed in AUTO position.
- (2.) Thermostat:  
When the room temperature rises to a point that is slightly above the cooling control setting of the thermostat, the thermostat completes the circuit between thermostat terminal R to terminals Y, O and G. These completed circuits through the thermostat connect contactor coil (C) (through unit wire Y) and Indoor Fan board (through unit wire G) across the 24-v. secondary of transformer (TRAN).
- (3.) Place system switch or MODE control in HEAT position. Set control above room temperature. Observe that compressor, outdoor fan, and indoor blower motors start. Observe that heating cycle shuts down when control setting is satisfied.
- (4.) When using an automatic changeover room thermostat place both SYSTEM or MODE control and FAN mode switches in AUTO positions. Observe that unit operates in Cooling mode when temperature control is set to "call for Cooling" (below room temperature), and unit operates in Heating mode when temperature control is set to "call for Heating" (above room temperature).

**NOTE:** Once the compressor has started and then has stopped, it should not be started again until 5 minutes have elapsed. The defrost board has a built-in 5 minute delay between cycles. The 5 minute compressor delay also applies to heat pump heating mode.

### Step 1 — Check for Refrigerant Leaks

Proceed as follows to locate and repair a refrigerant leak and to charge the unit:

1. Locate leak and make sure that refrigerant system pressure has been relieved and reclaimed from both high- and low-pressure ports.

2. Repair leak following Refrigerant Service procedures.

**NOTE:** Install a bi-flow filter drier whenever the system has been opened for repair.

3. Add a small charge of R-410A refrigerant vapor to system and leak-test unit.
4. Recover refrigerant from refrigerant system and evacuate to 500 microns if no additional leaks are not found.
5. Charge unit with Puron (R-410A) refrigerant, using an electronic scale. Refer to unit rating plate for required charge.

### Step 2 — Start-Up Adjustments

Complete the required procedures given in the Pre-Start-Up section before starting the unit. Do not jumper any safety devices when operating the unit. Do not operate the unit in Cooling mode when the outdoor temperature is below 40°F (4°C) (unless accessory low-ambient kit is installed).

**IMPORTANT:** Three-phase, scroll compressors are direction oriented. Unit must be checked to ensure proper compressor 3-phase power lead orientation. If not corrected within 5 minutes, the internal protector will shut off the compressor. The 3-phase power leads to the unit must be reversed to correct rotation. When turning backwards, the difference between compressor suction and discharge pressures may be near zero.

## **604D--A Sequence of Operation**

- a. CONTINUOUS FAN
  - (1.) Thermostat closes circuit R to G energizing the blower motor for continuous fan.
- b. COOLING MODE
  - (1.) If indoor temperature is above temperature set point, thermostat closes circuits R to G, R to Y and R to O-The unit delivers cooling airflow.
- c. ELECTRIC HEATING MODE
  - (1.) Thermostat closes circuit R to W/W1, or W2 and R to G. There are no on or off delays.
- d. HEAT PUMP HEATING MODE
  - (1.) Thermostat closes circuits R to G and R to Y. The compressor, indoor and outdoor fans are energized.
- e. HEAT PUMP HEATING WITH AUXILIARY ELECTRIC HEAT
  - (1.) Thermostat closes circuits R to G, R to Y and R to W/W1 or W2. The compressor, indoor and outdoor fans are energized, as well as the electric heat relays.
- f. DEFROST MODE
  - The defrost mode is automatically energized by the defrost board during heating mode. The defrost board energizes "O" (reversing valve) and "W2" (electric heat). It also de-energizes the outdoor fan. When defrost is complete, unit will return to heating mode. If room thermostat is satisfied during defrost, unit will shut down and restart in defrost on next call for heat.

### **Checking and Adjusting Refrigerant Charge**

The refrigerant system is fully charged with Puron (R-410A) refrigerant and is tested and factory sealed.

**NOTE:** Adjustment of the refrigerant charge is not required unless the unit is suspected of not having the proper Puron (R-410A) charge.

A subcooling charging chart is attached to the inside of the compressor access panel (see Fig. 20). The chart includes the required liquid line temperature at given discharge line pressures and outdoor ambient temperatures.

An accurate thermocouple- or thermistor-type thermometer, and a gauge manifold are required when using the subcooling charging method for evaluating the unit charge. Do not use mercury or small dial-type thermometers because they are not adequate for this type of measurement.

**NOTE:** Allow system to operate for a minimum of 15 minutes before checking or adjusting refrigerant charge.

**IMPORTANT:** When evaluating the refrigerant charge, an indicated adjustment to the specified factory charge must always be very minimal. If a substantial adjustment is indicated, an abnormal condition exists somewhere in the cooling system, such as insufficient airflow across either coil or both coils.

Proceed as follows:

1. Remove caps from low- and high-pressure service fittings.
2. Using hoses with valve core depressors, attach low- and high-pressure gauge hoses to low- and high-pressure service fittings, respectively.
3. Start unit and let run until system pressures stabilize.
4. Measure and record the following:
  - a. Outdoor ambient-air temperature ( $^{\circ}\text{F}$  [ $^{\circ}\text{C}$ ] db).
  - b. Liquid line temperature ( $^{\circ}\text{F}$  [ $^{\circ}\text{C}$ ]) at TXV.
  - c. Discharge (high-side) pressure (psig).
  - d. Suction (low-side) pressure (psig) (for reference only).
5. Using Cooling Charging Charts compare outdoor-air temperature ( $^{\circ}\text{F}$  [ $^{\circ}\text{C}$ ] db) with the discharge line pressure

(psig) to determine desired system operating liquid line temperature (See Fig. 17).

6. Compare actual liquid line temperature with desired liquid line temperature. Using a tolerance of  $\pm 2^{\circ}\text{F}$  ( $\pm 1.1^{\circ}\text{C}$ ), add refrigerant if actual temperature is more than  $2^{\circ}\text{F}$  ( $1.1^{\circ}\text{C}$ ) higher than proper liquid line temperature, or remove refrigerant if actual temperature is more than  $2^{\circ}\text{F}$  ( $1.1^{\circ}\text{C}$ ) lower than required liquid line temperature.

**NOTE:** If the problem causing the inaccurate readings is a refrigerant leak, refer to Check for Refrigerant Leaks section.

### **Indoor Airflow and Airflow Adjustments**

## **! CAUTION**

### **UNIT OPERATION HAZARD**

Failure to follow this caution may result in unit damage.

For cooling operation, the recommended airflow is 350 to 450 cfm for each 12,000 Btuh of rated cooling capacity. For heating operation, the airflow must produce a temperature rise that falls within the range stamped on the unit rating plate.

604D -- A

## **! WARNING**

### **ELECTRICAL SHOCK HAZARD**

Failure to follow this warning could result in personal injury or death.

Disconnect electrical power to the unit and install lockout tag before changing blower speed.

This unit has independent fan speeds for gas heating and cooling. In addition, this unit has the field-selectable capability to run two different cooling fan speeds: A normal cooling fan speed (350~400 CFM/Ton) and an enhanced dehumidification fan speed (As low as 320 CFM/Ton) for use with either a dehumidistat or a thermostat that supports dehumidification.

The cooling speed is marked "LOW" on the interface fan board (IFB) (See. Fig. 15). The factory-shipped settings are noted in Table 4. There are 4 additional speed tap wires available for use in either electric heating or cooling (For color coding on the indoor fan motor leads, see Table 3). The additional 4 speed tap wires are shipped loose with vinyl caps and are located in the control box, near the interface fan board (IFB) (See Fig. 15).

### **Single Cooling Fan Speed Set-up (Dehumidification feature not used)**

To change cooling speed:

1. Remove the vinyl cap off of the desired speed tap wire (Refer to Table 3 for color coding). Add the wet coil pressure drop in Table 5 to the system static to determine the correct cooling airflow speed in Table 4 that will deliver the nominal cooling airflow as listed in Table 1 for each size.
2. Remove the current speed tap wire from the "LOW" terminal on the interface fan board (IFB) (See Fig. 15) and place vinyl cap over the connector on the wire.
3. Connect the desired speed tap wire to the "LOW" terminal on the interface fan board (IFB).

**NOTE:** If accessory electric heat is installed, and the electric heat fan speed is chosen to be the same as the normal cooling fan speed, the dry airflow must meet or exceed the minimum airflow speed specified in Table 2 for the specific size unit.

## Two Cooling Fan Speeds Set-up (Dehumidification feature used)

**IMPORTANT:** Dehumidification control must open control circuit on humidity rise above set point.

Use of the dehumidification cooling fan speed requires use of either a 24 VAC dehumidistat or a thermostat which includes control of a 24 VAC dehumidistat connection. In either case, the dehumidification control must open the control circuit on humidity rise above the dehumidification set point. Dehumidification controls are available with the reverse logic; these must not be used.

1. Using Fig. 15, move the two pin DEHUM jumper from the “STD” position to the “DEHUM” position.
2. Remove fan speed tap wire from the “LOW” terminal on the interface fan board (IFB) (See Fig. 15).
3. Determine correct normal cooling fan speed for unit and application. Add the wet coil pressure drop in Table 5 to the system static to determine the correct cooling airflow speed in Table 4 that will deliver the nominal cooling airflow as listed in Table 1 for each size.
- NOTE: If accessory electric heat is installed, the dry airflow must meet or exceed the minimum airflow speed specified in Table 2 for the specific size unit. The electric heat fan speed will be the same as the normal cooling fan speed.
4. Remove the vinyl cap off of the desired speed tap wire (Refer to Table 3 for color coding) for the normal cooling fan speed and place desired speed tap wire on “HIGH” on the interface board.
5. Refer to airflow tables (Table 4) to determine allowable speeds for the dehumidification cooling fan speed. In Table 4, speeds that are not allowed for dehumidification cooling are shaded.
6. Remove the vinyl cap off of the desired speed tap wire (Refer to Table 3 for color coding) for the dehumidification cooling fan speed and place desired speed tap wire on the “LOW” connection on the interface board (IFB). Verify that static pressure is in the acceptable range for the speed tap to be used for dehumidification cooling.
7. Use any spare vinyl plugs to cap any unused speed tap wires.

**Table 3 – Color Coding for Indoor Fan Motor Leads**

Black = High Speed
Orange = Med-High Speed
Red = Med Speed
Pink = Med-Low Speed
Blue = Low Speed

## Single Speed Cooling With Higher Electric Heat Speed

This unit can also be configured to operate with single speed cooling and a higher speed for an accessory electric heater.

1. Using Fig. 15, move the two pin DEHUM jumper from the “STD” position to the “DEHUM” position.
2. See Table 2 for minimum airflow for electric heat operation. Add electric heater and filter pressure drop to duct system static pressure to determine total external static pressure.
3. Select speed tap from Table 4 that will achieve required airflow from Table 2.
4. Remove the vinyl cap off of the desired speed tap wire (Refer to Table 3 for color coding).
5. Connect the desired speed tap wire to the “HIGH” terminal on the interface fan board (IFB).

## **CAUTION**

### **UNIT OPERATION HAZARD**

Failure to follow this caution may result in unit component damage or improper operation.

To use this mode, a speed connection must be made on the “HIGH” terminal that meets or exceeds the minimum airflow found in Table 2.

## **WARNING**

### **ELECTRICAL SHOCK HAZARD**

Failure to follow this warning could result in personal injury or death.

Disconnect electrical power to the unit and install lockout tag before changing blower speed.

## Continuous Fan Operation

When the DEHUM feature is not used, the continuous fan speed will be the same as cooling fan speed. When the DEHUM feature is used, the continuous fan will operate on IFB “LOW” speed when the DH control lead is not energized, or IFB “HIGH” speed when the DH lead is energized (see Fig. 15).

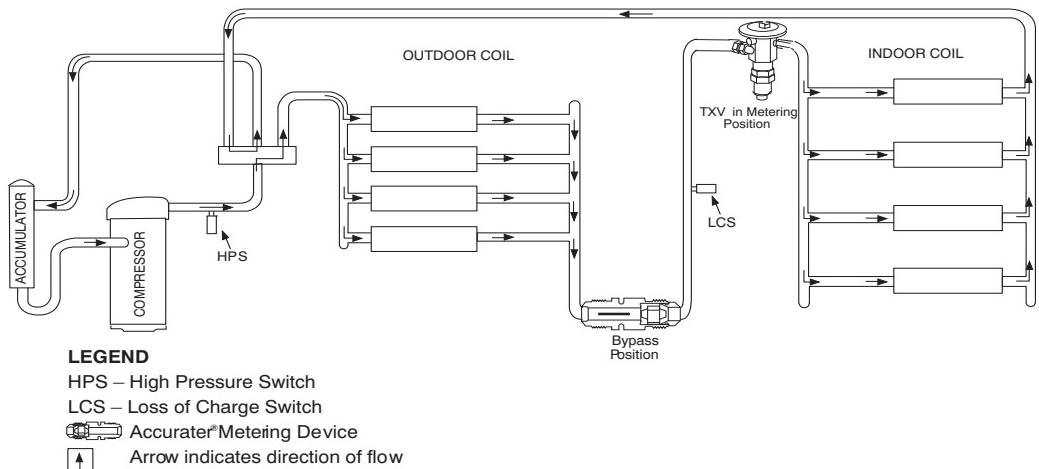
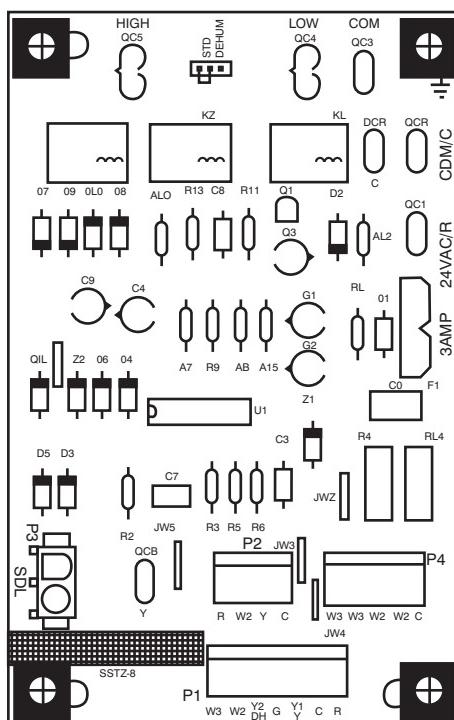


Fig. 14 - Typical Heat Pump Operation, Cooling Mode

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604D --A



A09059

Fig. 15 - Interface Fan Board (IFB)

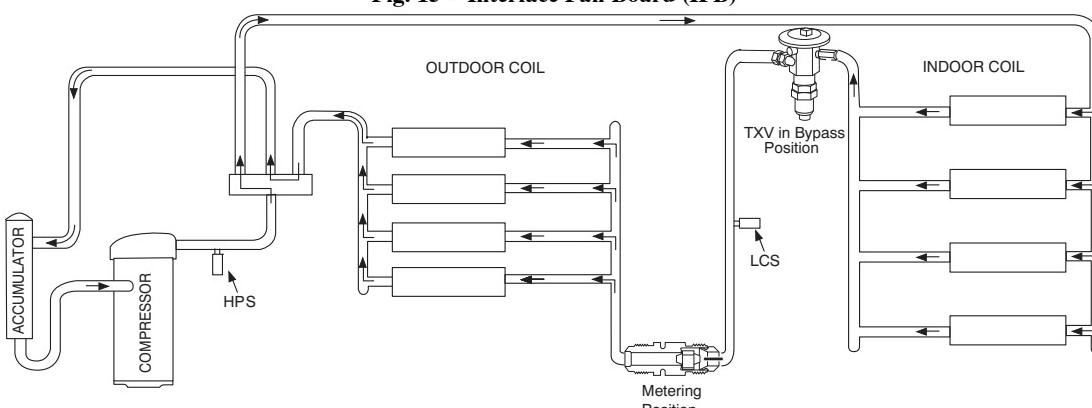


Fig. 16 - Typical Heat Pump Operation, Heating Mode

C03012

## Step 3 — Defrost Control

### Quiet Shift

Quiet Shift is a field-selectable defrost mode, which will eliminate occasional noise that could be heard at the start of defrost cycle and restarting of heating cycle. It is selected by placing DIP switch 3 (on defrost board) in ON position.

When Quiet Shift switch is placed in ON position, and a defrost is initiated, the following sequence of operation will occur. Reversing valve will energize, outdoor fan will turn off, compressor will turn off for 30 sec and then turn back on to complete defrost. At the start of heating after conclusion of defrost reversing valve will de-energize, compressor will turn off for another 30 sec, and the outdoor fan will stay off for 40 sec, before starting in the Heating mode.

### Defrost

The defrost control is a time/temperature control which includes a field-selectable time period (DIP switch 1 and 2 on the board) between defrost cycles of 30, 60, 90, or 120 minutes (factory set at 60 minutes). To initiate a forced defrost, two options are available depending on the status of the defrost thermostat.

If defrost thermostat is closed, speed-up pins (J1) must be shorted by placing a flat head screw driver in between for 5 sec and releasing, to observe a complete defrost cycle. When the Quiet Shift switch is selected, compressor will be turned off for two 30 sec intervals during this complete defrost cycle, as explained previously. When Quiet Shift switch is in factory default OFF position, a normal and complete defrost cycle will be observed.

If defrost thermostat is in open position, and speedup pins are shorted (with a flat head screw driver) for 5 sec and released, a short defrost cycle will be observed (actual length is dependent upon the selected Quiet Shift position). When Quiet Shift switch is in ON position, the length of defrost is 1 minute (30 sec compressor off period followed by 30 sec of defrost with compressor operation). On return to heating operation, compressor will again turn off for an additional 30 sec and the outdoor fan for 40 sec. When the Quiet Shift is in OFF position, only a brief 30 sec. cycle will be observed.

**NOTE:** Unit will remain in defrost until defrost thermostat reopens at approximately 65°F (18°C) coil temperature at liquid line or remainder of defrost cycle time.

### **MAINTENANCE**

To ensure continuing high performance, and to minimize the possibility of premature equipment failure, periodic maintenance must be performed on this equipment. This heat pump unit should be inspected at least once each year by a qualified service person. To troubleshoot unit, refer to Table 9.

**NOTE:** TO EQUIPMENT OWNER: Consult your local dealer about the availability of a maintenance contract.



## WARNING

### **PERSONAL INJURY AND UNIT DAMAGE HAZARD**

Failure to follow this warning could result in personal injury or death and unit component damage.

The ability to properly perform maintenance on this equipment requires certain expertise, mechanical skills, tools and equipment. If you do not possess these, do not attempt to perform any maintenance on this equipment, other than those procedures recommended in the Owner's Manual.



## WARNING

### **ELECTRICAL SHOCK HAZARD**

Failure to follow these warnings could result in personal injury or death:

1. Turn off electrical power to the unit and install a lockout tag before performing any maintenance or service on this unit.
2. Use extreme caution when removing panels and parts.
3. Never place anything combustible either on or in contact with the unit.



## CAUTION

### **CUT HAZARD**

Failure to follow this caution may result in personal injury.

When removing access panels (see Fig. 20) or performing maintenance functions inside your unit, be aware of sharp sheet metal parts and screws. Although special care is taken to reduce sharp edges to a minimum, be extremely careful when handling parts or reaching into the unit.



## CAUTION

### **UNIT OPERATION HAZARD**

Failure to follow this caution may result in improper operation.

Errors made when reconnecting wires may cause improper and dangerous operation. Label all wires prior to disconnecting when servicing.

The minimum maintenance requirements for this equipment are as follows:

1. Inspect air filter(s) each month. Clean or replace when necessary.
2. Inspect indoor coil, drain pan, and condensate drain each cooling season for cleanliness. Clean when necessary.
3. Inspect blower motor and wheel for cleanliness each cooling season. Clean when necessary.
4. Check electrical connections for tightness and controls for proper operation each cooling season. Service when necessary.

### **Step 1 — Air Filter**

**IMPORTANT:** Never operate the unit without a suitable air filter in the return-air duct system. Always replace the filter with the same dimensional size and type as originally installed. See Table 1 for recommended filter sizes.

Inspect air filter(s) at least once each month and replace (throwaway-type) or clean (cleanable-type) at least twice during each cooling season and twice during the heating season, or whenever the filter becomes clogged with dust and lint.

### **Indoor Blower and Motor**

**NOTE:** All motors are pre-lubricated. Do not attempt to lubricate these motors.

**NOTE:** 460 volt units have a stepdown autotransformer that supplies approximately 230 volts to a nominal 230 volt indoor blower motor.

For longer life, operating economy, and continuing efficiency, clean accumulated dirt and grease from the blower wheel and motor annually.



# WARNING

## ELECTRICAL SHOCK HAZARD

Failure to follow this warning could result in personal injury or death.

Disconnect and install lockout tag on electrical power to the unit before cleaning and lubricating the blower motor and wheel.

To clean the blower motor and wheel:

1. Remove and disassemble blower assembly as follows:
  - a. Remove blower access panel (see Fig. 20).
  - b. Disconnect 5 pin plug and 4 pin plug from indoor blower motor. Remove capacitor if required.
  - c. On all units remove blower assembly from unit. Remove screws securing blower to blower partition and slide assembly out. Be careful not to tear insulation in blower compartment.
  - d. Ensure proper reassembly by marking blower wheel and motor in relation to blower housing before disassembly.
  - e. Loosen setscrew(s) that secures wheel to motor shaft, remove screws that secure motor mount brackets to housing, and slide motor and motor mount out of housing.
2. Remove and clean blower wheel as follows:
  - a. Ensure proper reassembly by marking wheel orientation.
  - b. Lift wheel from housing. When handling and/or cleaning blower wheel, be sure not to disturb balance weights (clips) on blower wheel vanes.
  - c. Remove caked-on dirt from wheel and housing with a brush. Remove lint and/or dirt accumulations from wheel and housing with vacuum cleaner, using soft brush attachment. Remove grease and oil with mild solvent.
  - d. Reassemble wheel into housing.
  - e. Reassemble motor into housing. Be sure setscrews are tightened on motor shaft flats and not on round part of shaft. Reinstall blower into unit. Reinstall capacitor if required.
  - f. Connect 5 pin plug and 4 pin plug to indoor blower motor.
  - g. Reinstall blower access panel (see Fig. 20).
3. Restore electrical power to unit. Start unit and check for proper blower rotation and motor speeds during cooling cycles.

## Step 2 — Outdoor Coil, Indoor Coil, and Condensate Drain Pan

Inspect the condenser coil, evaporator coil, and condensate drain pan at least once each year.

The coils are easily cleaned when dry; therefore, inspect and clean the coils either before or after each cooling season. Remove all obstructions, including weeds and shrubs, that interfere with the airflow through the condenser coil.

Straighten bent fins with a fin comb. If coated with dirt or lint, clean the coils with a vacuum cleaner, using the soft brush attachment. Be careful not to bend the fins. If coated with oil or grease, clean the coils with a mild detergent-and-water solution. Rinse coils with clear water, using a garden hose. Be careful not to splash water on motors, insulation, wiring, or air filter(s). For best results, spray condenser coil fins from inside to outside the unit. On units with an outer and inner condenser coil, be sure to clean between the coils. Be sure to flush all dirt and debris from the unit base.

Inspect the drain pan and condensate drain line when inspecting the coils. Clean the drain pan and condensate drain by removing all foreign matter from the pan. Flush the pan and drain trough with clear water. Do not splash water on the insulation, motor, wiring, or air filter(s). If the drain trough is restricted, clear it with a plumbers snake or similar probe device.

## Step 3 — Outdoor Fan

Keep the condenser fan free from all obstructions to ensure proper cooling operation. Never place articles on top of the unit. Damage to unit may result.

1. Remove 6 screws holding outdoor grille and motor to top cover.
2. Turn motor/grille assembly upside down on top cover to expose fan blade.
3. Inspect the fan blades for cracks or bends.
4. If fan needs to be removed, loosen setscrew and slide fan off motor shaft.
5. When replacing fan blade, position blade back to same position as before.
6. Ensure that setscrew engages the flat area on the motor shaft when tightening.
7. Replace grille.

604D -- A

**Table 4 – Dry Coil Air Delivery\* - Horizontal and Downflow Discharge - Unit 604D--A24-60 Series A**

UNIT	MOTOR SPEED	WIRE COLOR		EXTERNAL STATIC PRESSURE (IN. W.C.)								
				0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9
604D--A24	Low	Blue	CFM	754	650	538	429	---	---	---	---	---
	Med-Low	Pink	CFM	851	777	675	591	475	---	---	---	---
	Medium <sup>1</sup>	Red	CFM	941	851	774	684	576	479	---	---	---
	Med-High	Orange	CFM	1009	917	840	759	667	577	447	---	---
	High	Black	CFM	1241	1167	1111	1036	969	881	818	731	640
604D--A30	Low	Blue	CFM	741	638	547	415	---	---	---	---	---
	Med-Low	Pink	CFM	973	887	823	733	665	538	451	---	---
	Medium <sup>1</sup>	Red	CFM	1088	1023	954	881	800	723	658	563	461
	Med-High <sup>1</sup>	Orange	CFM	1140	1064	996	915	840	758	687	564	480
	High	Black	CFM	1202	1140	1082	1015	961	881	810	732	631
604D--A36	Low	Blue	CFM	1234	1168	1093	1021	961	894	825	759	687
	Med-Low	Pink	CFM	1290	1223	1154	1090	1027	977	894	828	762
	Medium <sup>1</sup>	Red	CFM	1354	1290	1226	1158	1102	1046	981	918	843
	Med-High	Orange	CFM	1606	1546	1489	1430	1371	1316	1258	1208	1140
	High	Black	CFM	1630	1580	1517	1463	1407	1339	1277	1210	1131
604D--A42	Low	Blue	CFM	1295	1234	1182	1126	1075	1016	955	898	857
	Med-Low	Pink	CFM	1345	1282	1235	1194	1140	1095	1027	974	921
	Medium <sup>1</sup>	Red	CFM	1505	1452	1413	1358	1323	1282	1234	1169	1130
	Med-High <sup>1</sup>	Orange	CFM	1545	1492	1449	1411	1362	1313	1278	1231	1188
	High	Black	CFM	1705	1643	1607	1568	1518	1483	1448	1404	1360
604D--A48	Low	Blue	CFM	1402	1351	1311	1263	1224	1172	1136	1080	1041
	Med-Low	Pink	CFM	1457	1404	1367	1318	1284	1233	1197	1144	1104
	Medium <sup>1</sup>	Red	CFM	1736	1695	1642	1601	1553	1512	1465	1427	1381
	Med-High	Orange	CFM	2149	2111	2062	2026	1980	1945	1905	1864	1793
	High	Black	CFM	2344	2306	2259	2203	2141	2070	1991	1902	1803
604D--A60	Low	Blue	CFM	1445	1389	1341	1281	1236	1189	1139	1072	1027
	Med-Low	Pink	CFM	1678	1635	1602	1558	1513	1474	1438	1404	1349
	Medium <sup>1</sup>	Red	CFM	1927	1893	1858	1824	1791	1759	1720	1689	1640
	Med-High	Orange	CFM	2131	2088	2065	2013	1982	1941	1888	1860	1785
	High	Black	CFM	2461	2409	2339	2286	2192	2140	2062	1968	1874

\* Air delivery values are without air filter and are for dry coil (See 604D--A Wet Coil Pressure Drop Table).

<sup>1</sup> Factory-shipped cooling speed

NOTE: Deduct field-supplied air filter pressure drop and wet coil pressure drop to obtain external static pressure available for ducting.

Shaded areas indicate speed/static combinations that are not permitted for dehumidification speed.

**Table 5 – 604D--A Wet Coil Pressure Drop (IN. W.C.)**

UNIT SIZE	STANDARD CFM (S.C.F.M)														
	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900
24		0.06	0.07	0.08	0.09	0.1									
30				0.12	0.15	0.19	0.23	0.27							
36						0.07	0.11	0.18	0.26	0.35					
42								0.04	0.07	0.1	0.15	0.21			
48										0.11	0.14	0.17	0.22	0.28	
60											0.1	0.17	0.23	0.31	0.36

**Table 6 – Wet Coil Air Delivery (CFM) - Downflow - High Speed with 1-in. (25 mm) Filter and Economizer**

UNIT SIZE	EXTERNAL STATIC PRESSURE (IN. W.C.)										
	0.1	0.2	0.3	0.4	0.5	0.6	0.7	0.8	0.9	1.0	
36	1333	1289	1256	1214	1152	1118	1076	1035	997	950	
42	1612	1569	1527	1481	1451	1393	1351	1317	1278	1242	
48	2166	2085	2002	1919	1798	1709	1582	1467	1270	988	
60	2298	2239	2180	2110	2044	1951	1862	1777	1697	1591	

**Table 7 – Filter Pressure Drop Table (IN. W.C.)**

FILTER SIZE in. (mm)	CFM															
	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000
20X20X1 (508X508X25)	0.05	0.07	0.08	0.1	0.12	0.13	0.14	0.15	—	—	—	—	—	—	—	—
20X24X1 (508X610x25)	—	—	—	.09	.10	.11	.13	.14	.15	.16	—	—	—	—	—	—
24X30X1 (610X762x25)	—	—	—	0.04	0.05	0.06	0.07	0.07	0.08	0.09	0.1	—	—	—	—	—
24X36X1 (610X914X25)	—	—	—	—	—	—	—	0.06	0.07	0.07	0.08	0.09	0.09	0.10	0.11	0.13

**Table 8 – Electric Heat Pressure Drop Table (IN. W.C.)**

Small Cabinet: 24-36 cfm

	500	600	700	800	900	1000	1100	1200	1300	1400	1500	1600
5kw	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.06	0.07
7.5 kw	0.00	0.00	0.00	0.00	0.00	0.00	0.02	0.03	0.05	0.07	0.08	0.09
10 kw	0.00	0.00	0.00	0.00	0.00	0.02	0.04	0.06	0.07	0.09	0.10	0.11
15 kw	0.00	0.00	0.00	0.02	0.04	0.06	0.08	0.10	0.12	0.14	0.16	0.18
20 kw	0.00	0.00	0.02	0.04	0.06	0.08	0.09	0.11	0.13	0.15	0.17	0.19

**Electric Heat Pressure Drop Table (IN. W.C.)**

Large Cabinet 42-60 cfm

	1100	1200	1300	1400	1500	1600	1700	1800	1900	2000	2100	2200	2300	2400	2500
5kw	0.00	0.00	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12
7.5 kw	0.00	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13
10 kw	0.00	0.00	0.01	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13
15 kw	0.00	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15
20 kw	0.02	0.03	0.04	0.05	0.06	0.07	0.08	0.09	0.10	0.11	0.12	0.13	0.14	0.15	0.16

Model Size	Required Subcooling °F (°C)				Required Liquid Line Temperature for a Specific Subcooling (R-410A)								Required Subcooling (°C)			
	Outdoor Ambient Temperature °F (°C)				Required Subcooling (°F)				Required Subcooling (°C)				Required Subcooling (°C)			
	75 (24)	85 (29)	95 (35)	105 (41)	115 (46)	Pressure (psig)	5	10	15	20	25	Pressure (kPa)	3	6	8	11
024	15 (8.5)	15 (8.3)	15 (8.2)	14 (7.9)	196	66	61	56	51	46	41	1303	19	16	13	11
030	18 (10)	18 (10)	17 (9.4)	17 (9.4)	203	71	66	61	56	51	46	1351	20	17	15	12
036	18 (10)	18 (9.8)	16 (8.7)	15 (8.4)	210	73	68	63	58	53	48	1399	21	19	16	13
042	17 (9.3)	17 (9.3)	17 (9.2)	16 (8.9)	217	75	70	65	60	55	50	1448	23	20	17	14
048	20 (11.2)	20 (10.9)	19 (10.5)	18 (10.1)	224	77	72	67	62	57	52	1496	24	21	18	15
060	19 (10.6)	19 (10.4)	18 (10.1)	18 (9.7)	231	79	74	69	64	59	54	1544	25	22	19	16
					238	81	76	71	66	61	56	1593	26	23	20	18
												1641	27	24	21	19
<b>Charging Procedure</b>																
1- Measure Discharge line pressure by attaching a gauge to the service port.																
2- Measure the Liquid line pressure by attaching a temperature sensing device to it.																
3- Insulate the temperature sensing device so that the Outdoor Ambient doesn't affect the reading.																
4- Refer to the required Subcooling in the table based on the model size and the Outdoor Ambient temperature.																
5- Interpolate if the Outdoor ambient temperature lies in between the table values.																
6- Find the Pressure Value in the table corresponding to the measured Pressure of the Compressor Discharge line.																
7- Read across from the Pressure reading to obtain the Liquid line temperature for a required Subcooling																
8- Add Charge if the measured temperature is higher than the table value.																
9 - Remove charge if the measured temperature is lower than the table value.																
404	117	112	107	102	97	92	87	82	77	72	67	2785	47	45	42	39
414	119	114	109	104	99	94	89	84	79	74	69	2854	48	46	43	40
424	121	116	111	106	101	96	90	85	80	75	70	2923	49	47	44	41
434	123	118	113	108	103	98	93	88	83	78	73	2992	50	48	45	42
444	124	119	114	109	104	99	94	89	84	79	74	3061	51	48	46	43
454	126	121	116	111	106	101	96	91	86	81	76	3130	52	49	47	44
464	128	123	118	113	108	103	98	93	88	83	78	3199	53	50	48	45
474	129	124	119	114	109	104	99	94	89	84	79	3268	54	51	48	45
484	131	126	121	116	111	106	101	96	91	86	81	3337	55	52	49	47
494	132	127	122	117	112	107	102	97	92	87	82	3406	56	53	50	47
504	134	129	124	119	114	109	104	99	94	89	84	3475	57	54	51	48
514	136	131	126	121	116	111	106	101	96	91	86	3544	58	55	52	49
524	137	132	127	122	117	112	107	102	97	92	87	3612	58	56	53	47
534	139	134	129	124	119	114	109	104	99	94	89	3681	59	56	54	48

Fig. 17 - Cooling Charging Table-Subcooling

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604D--A

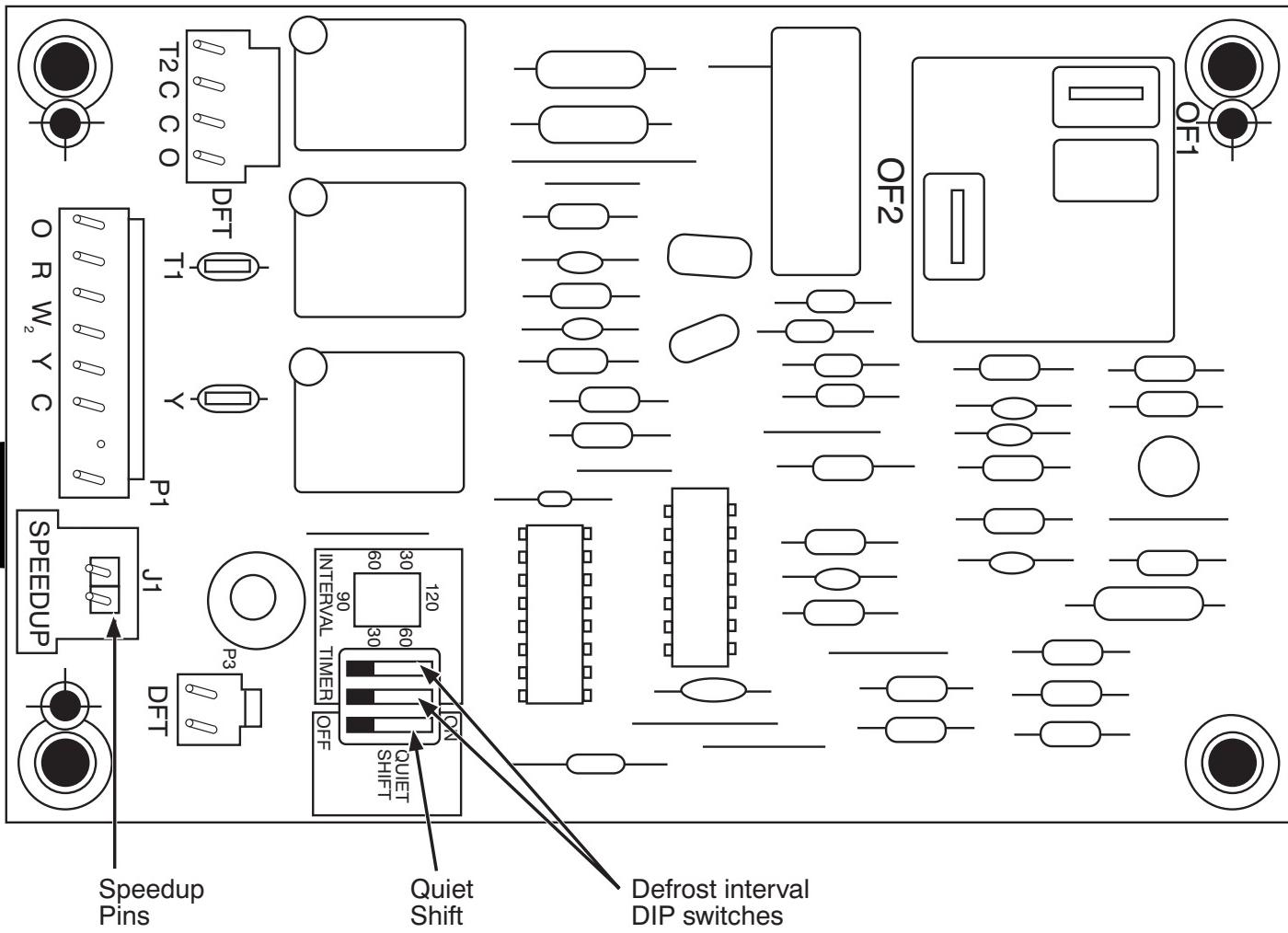


Fig. 18 - Defrost Control

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#### Step 4 — Electrical Controls and Wiring

Inspect and check the electrical controls and wiring annually. Be sure to turn off the electrical power to the unit.

Remove access panels (see Fig. 20) to locate all the electrical controls and wiring. Check all electrical connections for tightness. Tighten all screw connections. If any discolored or burned connections are noticed, disassemble the connection, clean all the parts, restrip the wire end and reassemble the connection properly and securely.

After inspecting the electrical controls and wiring, replace all the panels. Start the unit, and observe at least one complete cooling cycle to ensure proper operation. If discrepancies are observed in operating cycle, or if a suspected malfunction has occurred, check each electrical component with the proper electrical instrumentation. Refer to the unit wiring label when making these checkouts.

#### Step 5 — Refrigerant Circuit

Inspect all refrigerant tubing connections and the unit base for oil accumulation annually. Detecting oil generally indicates a refrigerant leak.

If oil is detected or if low performance is suspected, leak-test all refrigerant tubing using an electronic leak detector, or liquid-soap solution. If a refrigerant leak is detected, refer to Check for Refrigerant Leaks section.

If no refrigerant leaks are found and low performance is suspected, refer to Checking and Adjusting Refrigerant Charge section.

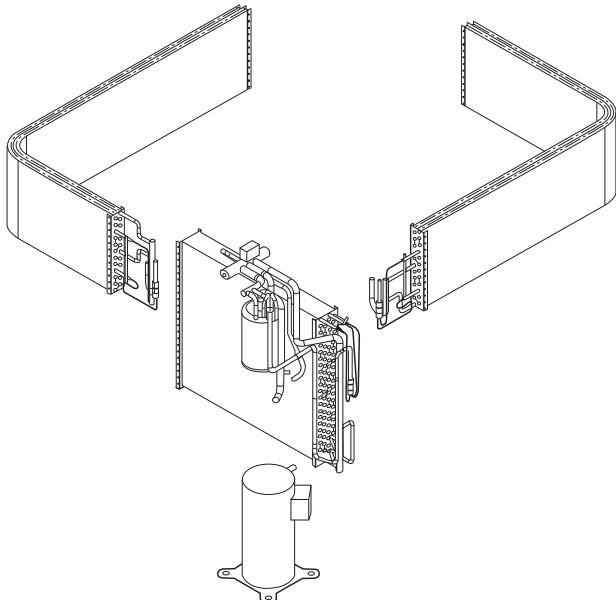
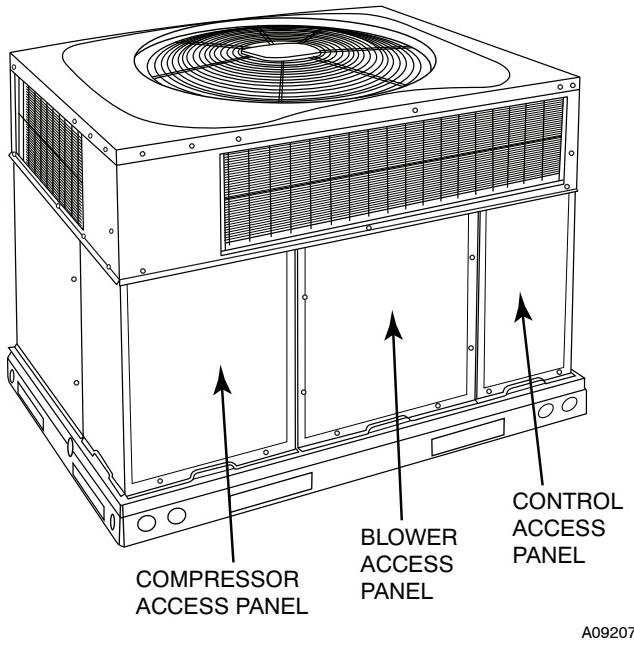


Fig. 19 - Refrigerant Circuit

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**Fig. 20 - Unit Access Panels**

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### **Step 6 — Indoor Airflow**

The heating and/or cooling airflow does not require checking unless improper performance is suspected. If a problem exists, be sure that all supply-air and return-air grilles are open and free from obstructions, and that the air filter is clean. When necessary, refer to Indoor Airflow and Airflow Adjustments section to check the system airflow.

### **Step 7 — Metering Devices-TXV & Piston**

This unit uses 2 types of metering devices. The outdoor metering device is a fixed orifice and is contained in the brass hex-body in each liquid line feeding the outdoor coils. The indoor metering device is a TXV type device.

### **Step 8 — Pressure Switches**

Pressure switches are protective devices wired into control circuit (low voltage). They shut off compressor if abnormally high or low pressures are present in the refrigeration circuit. These pressure switches are specifically designed to operate with Puron (R-410A) systems. R-22 pressure switches must not be used as replacements for the Puron (R-410A) system.

### **Step 9 — Loss of Charge Switch**

This switch is located on the liquid line and protects against low suction pressures caused by such events as loss of charge, low airflow across indoor coil, dirty filters, etc. It opens on a pressure drop at about 20 psig. If system pressure is above this, switch should be closed. To check switch:

1. Turn off all power to unit.
2. Disconnect leads on switch.
3. Apply ohm meter leads across switch. You should have continuity on a good switch.

**NOTE:** Because these switches are attached to refrigeration system under pressure, it is not advisable to remove this device for troubleshooting unless you are reasonably certain that a problem exists. If switch must be removed, remove and recover all system charge so that pressure gauges read 0 psi. Never open system without breaking vacuum with dry nitrogen.

### **Step 10 — High-Pressure Switch**

The high-pressure switch is located in the discharge line and protects against excessive condenser coil pressure. It opens at 650 psig.

High pressure may be caused by a dirty outdoor coil, failed fan motor, or outdoor air recirculation.

To check switch:

1. Turn off all power to unit.
2. Disconnect leads on switch.
3. Apply ohm meter leads across switch. You should have continuity on a good switch.

### **Step 11 — Copeland Scroll Compressor (Puron Refrigerant)**

The compressor used in this product is specifically designed to operate with Puron (R-410A) refrigerant and cannot be interchanged.

## **WARNING**

### **EXPLOSION HAZARD**

Failure to follow this warning could result in personal injury, death or property damage.

Wear safety glasses and gloves when handling refrigerants. Keep torches and other ignition sources away from refrigerant and oils.

The scroll compressor pumps refrigerant throughout the system by the interaction of a stationary and an orbiting scroll. The scroll compressor has no dynamic suction or discharge valves, and it is more tolerant of stresses caused by debris, liquid slugging, and flooded starts. The compressor is equipped with an internal pressure relief port. The pressure relief port is a safety device, designed to protect against extreme high pressure. The relief port has an operating range between 550 and 625 psig differential pressure.

### **Step 12 — Refrigerant System**

This step covers the refrigerant system of the 604D--A, including the compressor oil needed, servicing systems on roofs containing synthetic materials, the filter drier and refrigerant charging.

### **Refrigerant**

## **WARNING**

### **PROPERTY HAZARD, PERSONAL INJURY OR ENVIRONMENTAL HAZARD**

Failure to follow this warning could result in property damage or personal injury or death.

This system uses Puron (R-410A) refrigerant which has higher operating pressures than R-22 and other refrigerants. No other refrigerant may be used in this system. Gauge set, hoses, and recovery system must be designed to handle Puron. If you are unsure consult the equipment manufacturer.

### **Compressor Oil**

The Copeland scroll compressor uses 3MAF POE oil. If additional oil is needed, use Uniqema RL32-3MAF. If this oil is not available, use Copeland Ultra 32 CC or Mobil Arctic EAL22 CC. This oil is extremely hygroscopic, meaning it absorbs water readily. POE oils can absorb 15 times as much water as other oils designed to HCFC and CFC refrigerants. Take all necessary precautions to avoid exposure of the oil to the atmosphere.

### **Servicing Systems on Roofs with Synthetic Materials**

POE (polyolester) compressor lubricants are known to cause long term damage to some synthetic roofing materials. Exposure, even if immediately cleaned up, may cause embrittlement (leading to cracking) to occur in one year or more. When performing any service that may risk exposure of compressor oil to the roof, take appropriate precautions to protect roofing. Procedures which risk oil leakage include, but are not limited to, compressor replacement,

repairing refrigerant leaks, replacing refrigerant components such as filter drier, pressure switch, metering device, coil, accumulator, or reversing valve.

#### **Synthetic Roof Precautionary Procedure**

1. Cover extended roof working area with an impermeable polyethylene (plastic) drip cloth or tarp. Cover an approximate 10x10 ft (3x3 m) area.
2. Cover area in front of the unit service panel with a terry cloth shop towel to absorb lubricant spills and prevent run-offs, and protect drop cloth from tears caused by tools or components.
3. Place terry cloth shop towel inside unit immediately under component(s) to be serviced and prevent lubricant run-offs through the louvered openings in the unit base.
4. Perform required service.
5. Remove and dispose of any oil contaminated material per local codes.

#### **Liquid Line Filter Drier**

The biflow filter drier is specifically designed to operate with Puron. Use only factory-authorized components. Filter drier must be replaced whenever the refrigerant system is opened. When removing a filter drier, use a tubing cutter to cut the drier from the system. Do not unsweat a filter drier from the system. Heat from unsweating will release moisture and contaminants from drier into system.

#### **Puron (R-410A) Refrigerant Charging**

Refer to unit information plate and charging chart. Some R-410A refrigerant cylinders contain a dip tube to allow liquid refrigerant to flow from cylinder in upright position. For cylinders equipped with a dip tube, charge Puron units with cylinder in upright position and a commercial metering device in manifold hose. Charge refrigerant into suction-line.

### **Step 13 — System Information**

#### **Loss of Charge Switch**

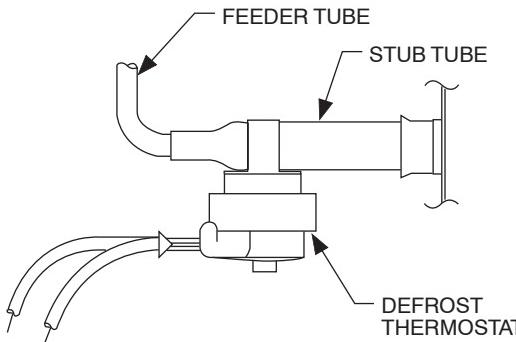
The loss of charge switch is a protective device wired into control circuit (low voltage). It shuts off the compressor if abnormally low pressures are present in the refrigeration circuit.

**NOTE:** Because these switches are attached to refrigeration system under pressure, it is not advisable to remove this device for troubleshooting unless you are reasonably certain that a problem exists. If switch must be removed, remove and recover all system charge so that pressure gauges read 0 psi. Never open system without breaking vacuum with dry nitrogen.

#### **Check Defrost Thermostat**

The defrost thermostat signals heat pump that conditions are right for defrost or that conditions have changed to terminate defrost. It is a thermally actuated switch clamped to outdoor coil to sense its temperature. Normal temperature range is closed at  $32^\circ \pm 3^\circ\text{F}$  ( $0 \pm 1.7^\circ\text{C}$ ) and open at  $65^\circ \pm 5^\circ\text{F}$  ( $18 \pm 2.8^\circ\text{C}$ ).

**NOTE:** The defrost thermostat is usually located on the lowest liquid leaving circuit of the left condenser coil.



C99029

**Fig. 21 - Defrost Thermostat**

## **TROUBLESHOOTING**

Refer to the Cooling and Heating Troubleshooting Chart (Table 9) for troubleshooting information.

## **START-UP CHECKLIST**

Use the Start-Up Checklist.

## PURON® (R-410A) QUICK REFERENCE GUIDE

- Puron refrigerant operates at 50-70 percent higher pressures than R-22. Be sure that servicing equipment and replacement components are designed to operate with Puron
- Puron refrigerant cylinders are rose colored.
- Recovery cylinder service pressure rating must be 400 psig, DOT 4BA400 or DOT BW400.
- Puron systems should be charged with liquid refrigerant. Use a commercial type metering device in the manifold hose when charging into suction line with compressor operating
- Manifold sets should be minimum 700 psig high side and 180 psig low side with 550 psig low-side retard.
- Use hoses with minimum 700 psig service pressure rating.
- Leak detectors should be designed to detect HFC refrigerant.
- Puron, as with other HFCs, is only compatible with POE oils.
- Vacuum pumps will not remove moisture from oil.
- Do not use liquid-line filter driers with rated working pressures less than 600 psig.
- Do not leave Puron suction line filter driers in line longer than 72 hours.
- Do not install a suction-line filter drier in liquid line.
- POE oils absorb moisture rapidly. Do not expose oil to atmosphere.
- POE oils may cause damage to certain plastics and roofing materials.
- Wrap all filter driers and service valves with wet cloth when brazing.
- A factory approved liquid-line filter drier is required on every unit.
- Do NOT use an R-22 TXV.
- Never open system to atmosphere while it is under a vacuum.
- When system must be opened for service, recover refrigerant, evacuate then break vacuum with dry nitrogen and replace filter driers. Evacuate to 500 microns prior to recharging.
- Do not vent Puron into the atmosphere.
- Observe all **warnings, cautions, and bold** text.
- All indoor coils must be installed with a hard shutoff Puron TXV metering device.

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Table 9 – Troubleshooting Chart

SYMPTOM	CAUSE	REMEDY
<b>Compressor and condenser fan will not start.</b>	Power failure	Call power company
	Fuse blown or circuit breaker tripped	Replace fuse or reset circuit breaker
	Defective contactor, transformer, or high-pressure, loss-of-charge or low-pressure switch	Replace component
	Insufficient line voltage	Determine cause and correct
	Incorrect or faulty wiring	Check wiring diagram and rewire correctly
	Thermostat setting too high	Lower thermostat setting below room temperature
<b>Compressor will not start but condenser fan runs</b>	Faulty wiring or loose connections in compressor circuit	Check wiring and repair or replace
	Compressor motor burned out, seized, or internal overload open	Determine cause Replace compressor
	Defective run/start capacitor, overload, start relay	Determine cause and replace
	One leg of 3-phase power dead	Replace fuse or reset circuit breaker Determine cause
<b>Three-phase scroll compressor makes excessive noise, and there may be a low pressure differential.</b>	Scroll compressor is rotating in the wrong direction	Correct the direction of rotation by reversing the 3-phase power leads to the unit.
<b>Compressor cycles (other than normally satisfying thermostat).</b>	Refrigerant overcharge or undercharge	Recover refrigerant, evacuate system, and recharge to capacities shown on rating plate
	Defective compressor	Replace and determine cause
	Insufficient line voltage	Determine cause and correct
	Blocked condenser	Determine cause and correct
	Defective run/start capacitor, overload or start relay	Determine cause and replace
	Defective thermostat	Replace thermostat
	Faulty condenser-fan motor or capacitor	Replace
	Restriction in refrigerant system	Locate restriction and remove
<b>Compressor operates continuously</b>	Dirty air filter	Replace filter
	Unit undersized for load	Decrease load or increase unit size
	Thermostat set too low	Reset thermostat
	Low refrigerant charge	Locate leak, repair, and recharge
	Mechanical damage in compressor	Replace compressor
	Air in system	Recover refrigerant, evacuate system, and recharge
<b>Excessive head pressure</b>	Condenser coil dirty or restricted	Clean coil or remove restriction
	Dirty air filter	Replace filter
	Dirty condenser coil	Clean coil
	Refrigerant overcharged	Recover excess refrigerant
	Air in system	Recover refrigerant, evacuate system, and recharge
<b>Head pressure too low</b>	Condenser air restricted or air short-cycling	Determine cause and correct
	Low refrigerant charge	Check for leaks, repair, and recharge.
	Compressor IPR leaking	Replace compressor
	Restriction in liquid tube	Remove restriction
<b>Excessive suction pressure</b>	High heat load	Check for source and eliminate
	Compressor IPR leaking	Replace compressor
	Refrigerant overcharged	Recover excess refrigerant
	Dirty air filter	Replace filter
<b>Suction pressure too low</b>	Low refrigerant charge	Check for leaks, repair and recharge
	Metering device or low side restricted	Remove source of restriction
	Insufficient evaporator airflow	Increase air quantity Check filter—replace if necessary
	Temperature too low in conditioned area	Reset thermostat
	Outdoor ambient below 55°F (12.7°C)	Install low-ambient kit
	Filter drier restricted	Replace filter

# **START-UP CHECKLIST**

(Remove and Store in Job Files)

## **I. PRELIMINARY INFORMATION**

MODEL NO.: \_\_\_\_\_  
SERIAL NO.: \_\_\_\_\_  
DATE: \_\_\_\_\_  
TECHNICIAN: \_\_\_\_\_

## **II. PRESTART-UP (Insert check mark in box as each item is completed)**

- ( ) VERIFY THAT ALL PACKING MATERIALS HAVE BEEN REMOVED FROM UNIT
- ( ) REMOVE ALL SHIPPING HOLD DOWN BOLTS AND BRACKETS PER INSTALLATION INSTRUCTIONS
- ( ) CHECK ALL ELECTRICAL CONNECTIONS AND TERMINALS FOR TIGHTNESS
- ( ) CHECK THAT INDOOR (EVAPORATOR) AIR FILTER IS CLEAN AND IN PLACE
- ( ) VERIFY THAT UNIT INSTALLATION IS LEVEL
- ( ) CHECK FAN WHEEL, AND PROPELLER FOR LOCATION IN HOUSING/ORIFICE AND SETSCREW TIGHTNESS

## **III. START-UP**

### **ELECTRICAL**

SUPPLY VOLTAGE \_\_\_\_\_  
COMPRESSOR AMPS \_\_\_\_\_  
INDOOR (EVAPORATOR) FAN AMPS \_\_\_\_\_

### **TEMPERATURES**

OUTDOOR (CONDENSER) AIR TEMPERATURE \_\_\_\_\_ DB  
RETURN-AIR TEMPERATURE \_\_\_\_\_ DB \_\_\_\_\_ WB  
COOLING SUPPLY AIR \_\_\_\_\_ DB \_\_\_\_\_ WB  
HEAT PUMP SUPPLY AIR \_\_\_\_\_  
ELECTRIC HEAT SUPPLY AIR \_\_\_\_\_

### **PRESURES**

REFRIGERANT SUCTION \_\_\_\_\_ PSIG, SUCTION LINE TEMP\* \_\_\_\_\_  
REFRIGERANT DISCHARGE \_\_\_\_\_ PSIG, LIQUID TEMP† \_\_\_\_\_

- ( ) VERIFY REFRIGERANT CHARGE USING CHARGING CHARTS

\* Measured at suction inlet to compressor

† Measured at liquid line leaving condenser.

604D -- A

# VERTICAL ECONOMIZER (FACTORY INSTALLED OPTION) GENERAL

Economizers are recommended for only commercial packaged products that have X13 motors. The Economizer system utilizes the latest technology available for integrating the use of free cooling with mechanical cooling for rooftop units. The solid state control system optimizes energy consumption, zone comfort, and equipment cycling by operating the compressors when the outdoor air temperature is too warm, integrating the compressor with outdoor air when free cooling is available, and locking out the compressor when outdoor air temperature is too cold. Demand ventilation is supported.

The Economizer system utilizes gear-drive technology with a direct-mount spring return actuator that will close upon loss of power. The Economizer system comes standard with an outdoor air temperature sensor, a supply air temperature sensor, and low temperature compressor lockout switch. Indoor enthalpy, outdoor enthalpy, and CO<sub>2</sub> sensors are available for field installation.

Barometric relief dampers provide natural building pressurization control. Barometric relief dampers are built into the design and are standard. See Table 10 for Hood Package contents. See Table 11 for sensor usage.

**Table 10 – Package Contents**

SMALL CHASSIS (Sizes 30 and 36)		LARGE CHASSIS (Sizes 42, 48, and 60)	
Qty	Content Description	Qty	Content Description
1	Hood Side, Right	1	Hood Side, Right
1	Hood Side, Left	1	Hood Side, Left
2	Angle, Filter	2	Angle, Filter
1	Aluminum Filter (20–1/2" x 16–1/2 x 1") (521 x 419 x 25 mm)	1	Aluminum Filter (20–1/2" x 16–1/2 x 1") (521 x 419 x 25 mm)
18	Screws (#10 – 14 x 5/8" w/Seal Washer)	18	Screws (#10 – 14 x 5/8" w/Seal Washer)
2	Screws (#8 – 18 x 3/4" Type B Pan Head)	2	Screws (#8 – 18 x 3/4" Type B Pan Head)
		1	Bracket, Sensor

**Table 11 – Economizer Sensor Usage**

APPLICATION	ECONOMIZER WITH OUTDOOR AIR DRY BULB SENSOR		
	Accessories Required		
Outdoor Air Dry Bulb	None, The outdoor air dry bulb sensor is factory installed.		
Single Enthalpy	HH57AC078		
Differential Enthalpy	HH57AC078 and CRENTDIF004A00*		
CO <sub>2</sub> for DCV Control Using a Wall-Mounted CO <sub>2</sub> Sensor	33ZCSENC02 or CGCDXSEN004A00		
CO <sub>2</sub> for DCV Control Using a Duct-Mounted CO <sub>2</sub> Sensor	33ZCSENC02 or CGCDXSEN004A00† and 33ZCASPC02 or CGCDXASP00100**	or	CRCBDIOX005A00†

\*CRENTDIF004A00 accessory is used on many different base units. As such, these kits may contain parts that will not be needed for installation.

†33ZCSENC02 and CGCDXSEN004A00 are accessory CO<sub>2</sub> sensors.

\*\*33ZCASPC02 AND CGCDXASP00100 are accessory aspirator boxes required for duct-mounted applications.

††CRCBDIOX005A00 is an accessory that contains both 33ZCSENC02 AND 33ZVASPC02 accessories.

## ACCESSORIES

The economizer has several field-installed accessories available to optimize performance. Refer to Table 12 for authorized parts.

**Table 12 – Accessory List**

DESCRIPTION	PART NUMBER
Outdoor Air Enthalpy Sensor	HH57AC078
Indoor Air Enthalpy Sensor	CRENTDIF004A00
Return Air CO <sub>2</sub> Sensor (4–20 mA)	CRCBDIOX005A00
CO <sub>2</sub> Room Sensor (4–20 mA)	33ZCSENC02 Or CGCDXSEN004A00
Aspirator Box for duct Mount CO <sub>2</sub> Sensor (4–20 mA)	33ZCASPC02 Or CGCDXASP001A00
Space Temperature and CO <sub>2</sub> Room Sensor with Override (4–20mA)	33ZCT55C02
Space Temperature and CO <sub>2</sub> Room Sensor with Override and Set Point (4–20mA)	33ZCT56C02
Heat Pump Relay Package	CPRLYKIT001A00

## INSTALLATION

### Small Chassis

To install the Vertical Economizer on the small chassis perform the following procedure:

1. Turn off unit power supply and install lockout tag.

### **! WARNING**

#### ELECTRICAL SHOCK HAZARD

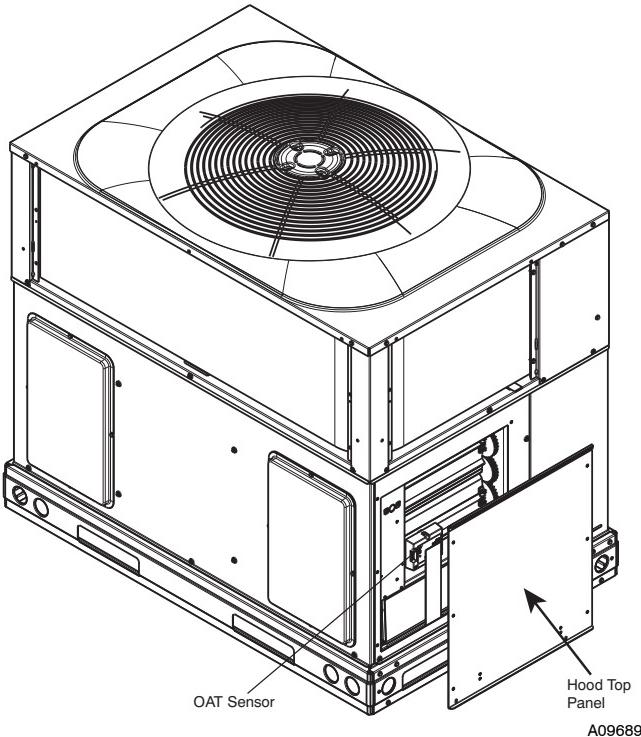
Failure to follow this warning could result in personal injury or death.

Before installing or servicing system, always turn off main power to system and install lockout tag. There may be more than one disconnect switch. Turn off accessory heater power switch if applicable.

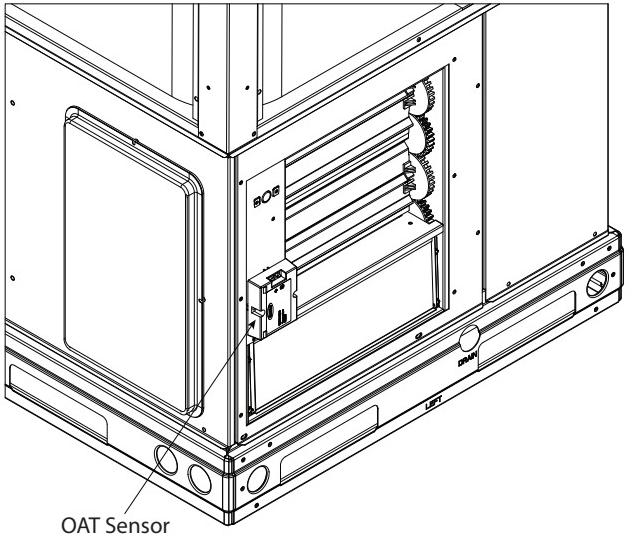
2. Remove economizer hood top panel from the return side of the unit. See Fig. 22. Keep screws and panel next to the unit.
3. Open economizer hood package found on the top skid.
4. Remove red shipping tape that attaches the outside air temperature (OAT) sensor to the economizer assembly. Using two #8 fasteners, found in the hood package, attach the OAT sensor to the economizer according to Fig. 23.

**NOTE:** See label attached to economizer for OAT installing details.

5. Remove horizontal return duct cover panel and cut the wire ties that hold the hood divider to the economizer assembly. Slide hood divider off from the two slots holding it in place and place next to the unit. See Fig. 24.



**Fig. 22 - Economizer Hood Top Panel Removal**



**Fig. 23 - Oat Sensor Installed**

6. Replace horizontal return duct cover panel. Screw in place ensuring all seams are air and watertight.

7. Install the 2 angle filter brackets to the right and left hood side panels respectively with the #10 screws provided. See Fig. 25.

8. Assemble hood according to Fig. 26 screwing together with provided #10 sheet metal screws.

9. Install assembled hood over the economizer opening in the replacement return chamber panel. See Fig. 27. Screw in place through pre-punched holes. Make sure all seams are air and watertight.

**NOTE:** The two wires that connect to the outside air temperature sensor (OAT) should remain accessible.

10. Connect the outside air temperature sensor (OAT) to the economizer per wiring diagram.

11. Open the filter clips on the inside of the hood top. Insert the aluminum filter into the hood and close the clips to hold in place. See Fig. 28.

12. To replace 12 x 20 x 1 (304.8mm x 508mm x 25.4mm) air filters, open the filter access door (horizontal return duct cover panel), remove old filters and install new disposable filters in filter rack. See Table 13 for filter part number.

**Table 13 – Filter Part Number**

DESCRIPTION	PART NUMBER
Indoor Coil Air Filter (304.8 x 508 x 25.4 mm)	KH01AA312

**NOTE:** The economizer control settings and the filters are accessible through the filter access door.

13. Economizer controls are set to a standard factory setting. Nevertheless, you can adjust these settings through the filter access door. Review the settings in the Operation section:

(2.) The standard economizer controller has a factory setting of “C” for the outdoor air temperature changeover and 63°F (17°C) for the supply air (mixed air) temperature sensor. The outdoor air temperature changeover setting is adjusted on the sensor by setting the dip switches on the sensor. The ABCD potentiometer on the economizer control should be set to the “D” position.

(3.) The low ambient compressor lockout switch setting is fixed at 42°F (5.6°C).

(4.) The minimum position for the outdoor air damper can be configured at the controller. When not using a CO<sub>2</sub> sensor, the DCV Max potentiometer must be completely closed (CCW) for the Minimum Position potentiometer to function correctly.

(5.) Settings for the optional outdoor enthalpy sensor, indoor enthalpy sensor, and CO<sub>2</sub> sensor can also be configured at the controller.

14. Replace the filter access panel. Screw in place ensuring all seams are air and watertight.

15. Install all economizer accessories then power HVAC unit and test cycle economizer.

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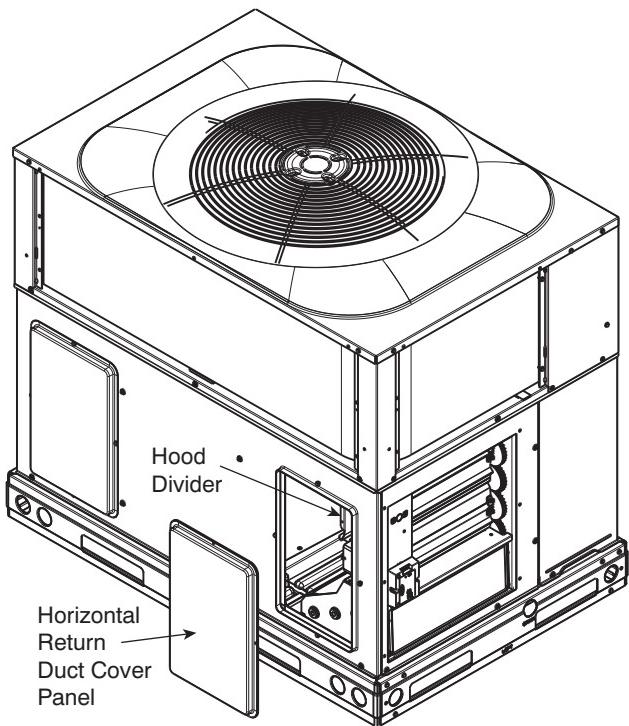
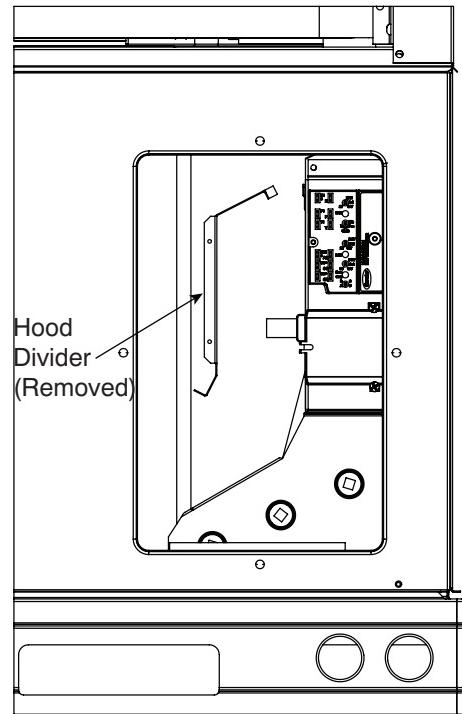


Fig. 24 - Horizontal Return Duct Cover Panel Removal



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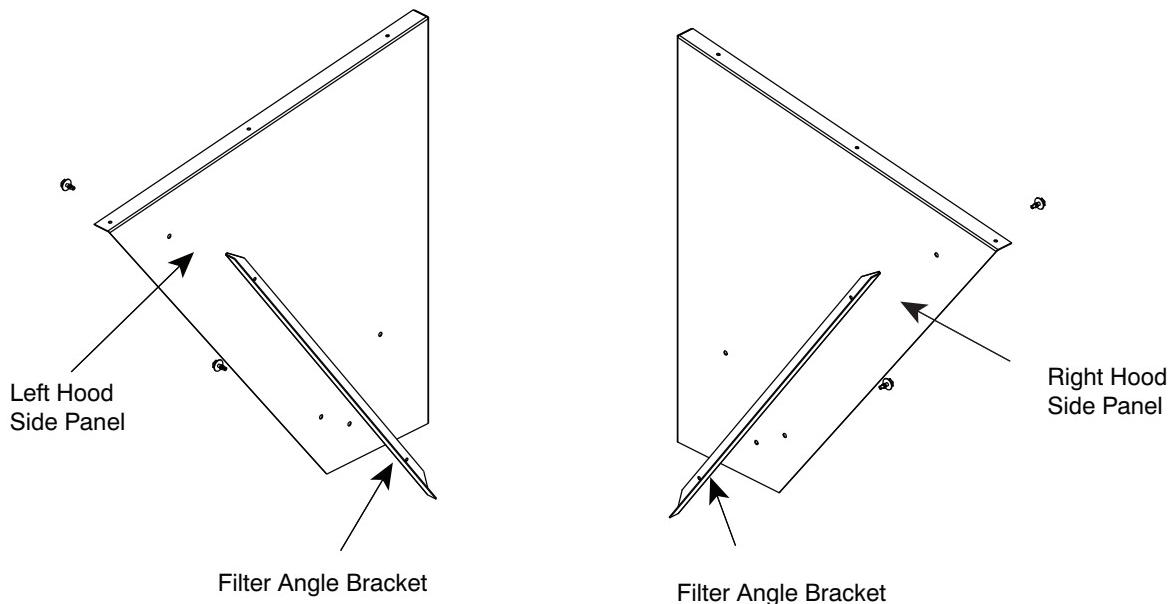
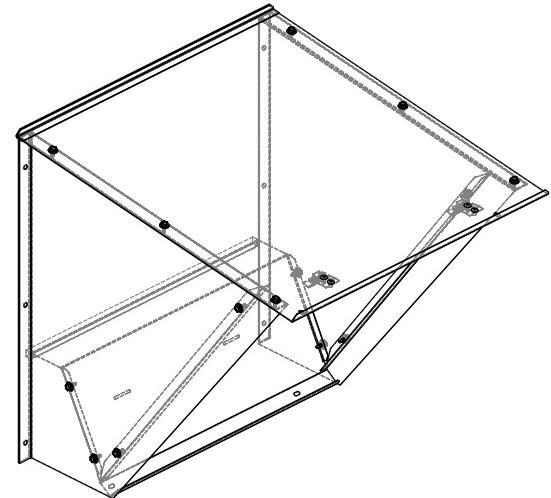
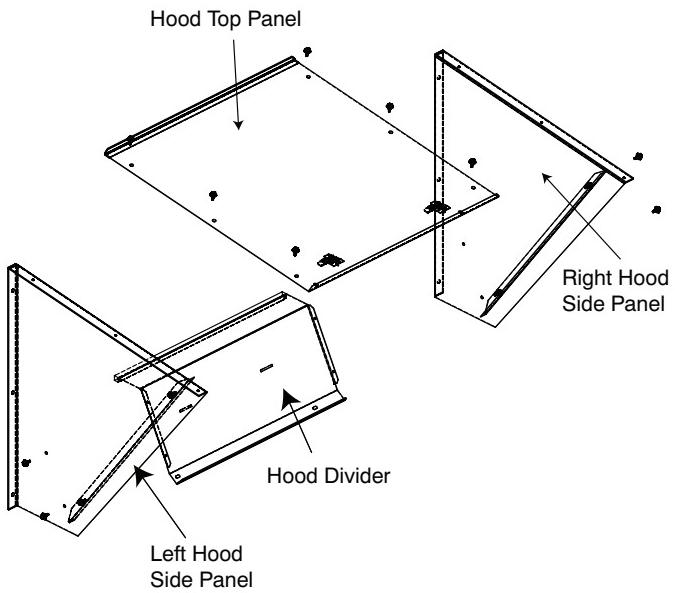


Fig. 25 - Filter Angle Bracket Installation

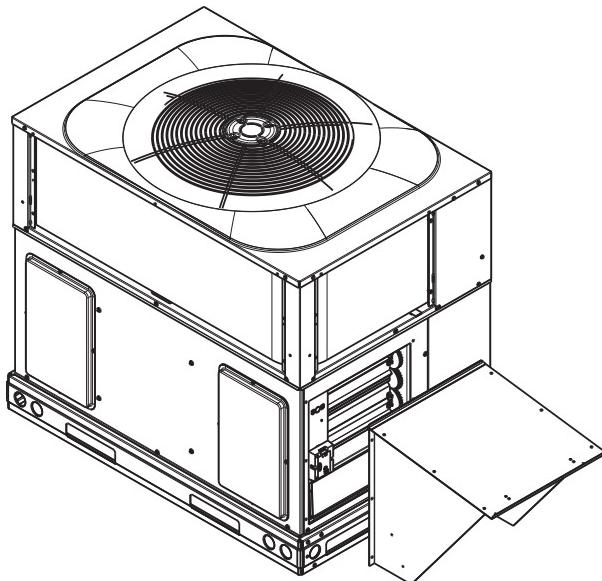
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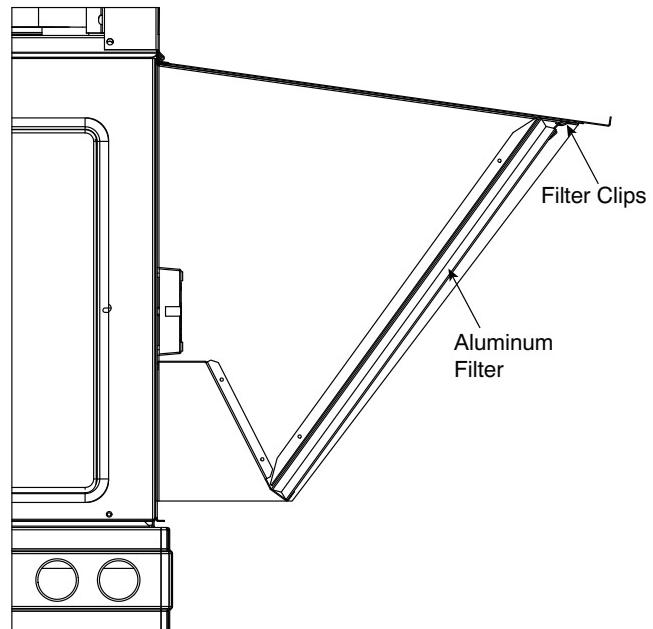
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**Fig. 26 - Economizer Hood Assembly**



A09694

**Fig. 27 - Economizer Hood Installation**



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**Fig. 28 - Filter Installation (See Through View)**

## **Large Chassis**

To install the Vertical Economizer on the large chassis perform the following procedure:

1. Turn off unit power supply and install lockout tag.

## **WARNING**

### **ELECTRICAL SHOCK HAZARD**

Failure to follow this warning could result in personal injury or death.

Before installing or servicing system, always turn off main power to system and install lockout tag. There may be more than one disconnect switch. Turn off accessory heater power switch if applicable.

2. Remove economizer hood top panel from the return side of the unit. See Fig. 29. Keep screws and panel next to the unit.
3. Remove red shipping tape that attaches the outside air temperature (OAT) sensor to the economizer assembly and place sensor next to the unit.
4. Remove horizontal return duct cover panel and cut the wire ties that hold the hood divider to the economizer assembly. Slide hood divider off from the two slots holding it in place and place next to the unit. See Fig. 30.
5. Replace horizontal return duct cover panel. Screw in place ensuring all seams are air and watertight.
6. Open economizer hood package found on the top skid. Mount OAT sensor to its assigned bracket by screwing together with provided two #8 fasteners. Afterwards install OAT sensor to the right side hood panel with the provided #10 screws. See Fig. 31.

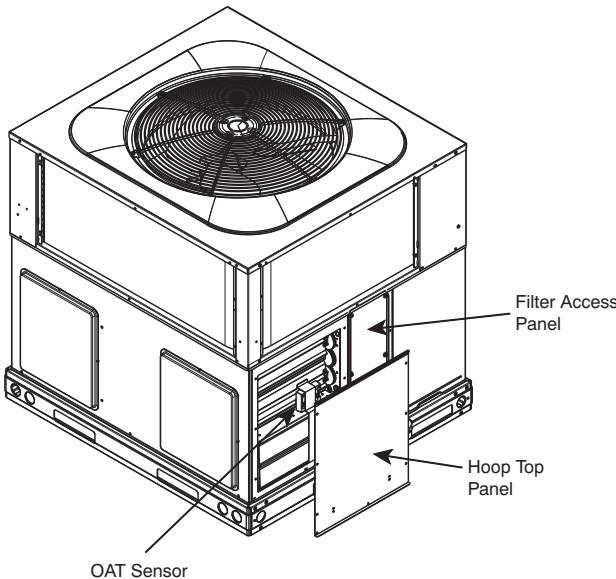
7. Install the 2 angle filter brackets to the right and left hood side panels respectively with the #10 screws provided. See Fig. 32.

8. Assemble hood according to Fig. 33 screwing together with provided #10 sheet metal screws.

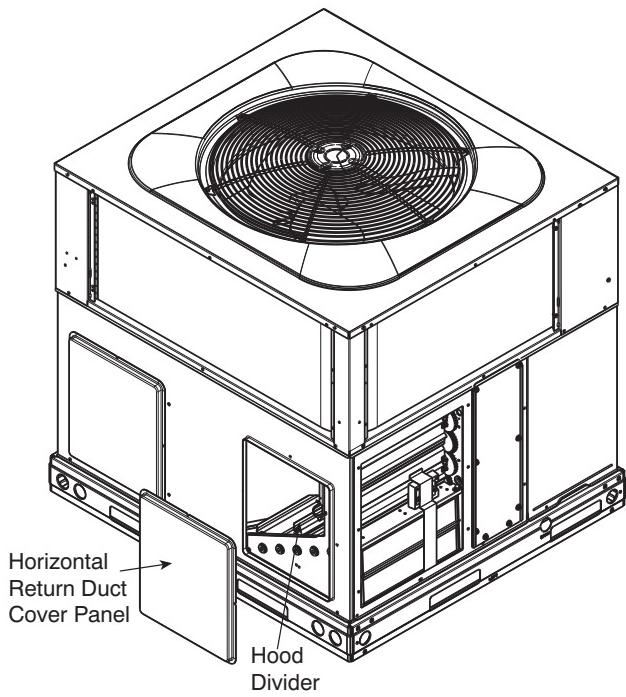
9. Install assembled hood over the economizer opening in the replacement return chamber panel. See Fig. 34. Screw in place through pre-punched holes. Make sure all seams are air and watertight.

**NOTE:** The two wires that connect to the outside air temperature sensor (OAT) should remain accessible.

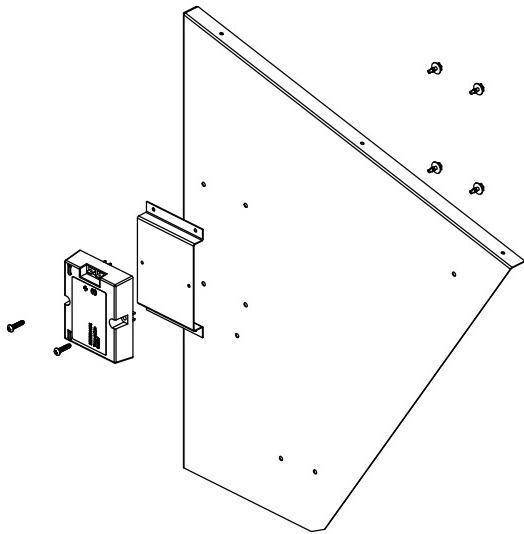
10. Connect the outside air temperature sensor (OAT) to the economizer per wiring diagram.



**Fig. 29 - Economizer Hood Top Panel Removal**



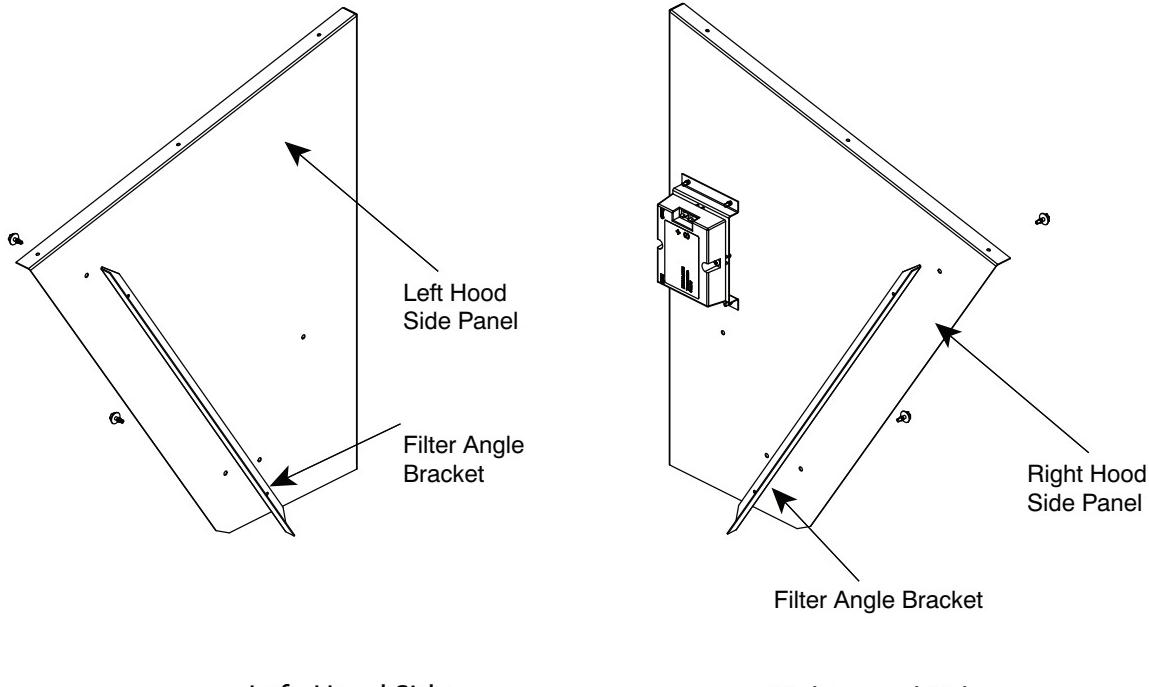
**Fig. 30 - Horizontal Return Duct Cover Panel and Hood Divider Removal**



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**Fig. 31 - OAT Bracket Installation**



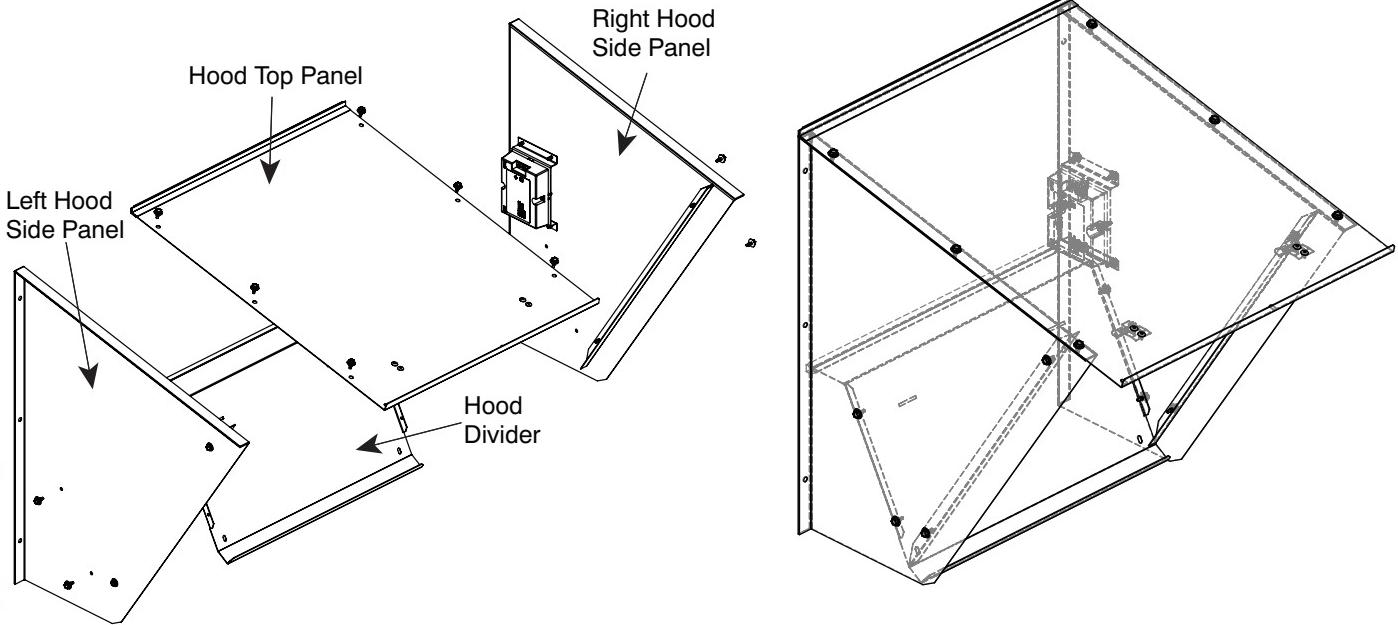
**Left Hood Side**

**Right Hood Side**

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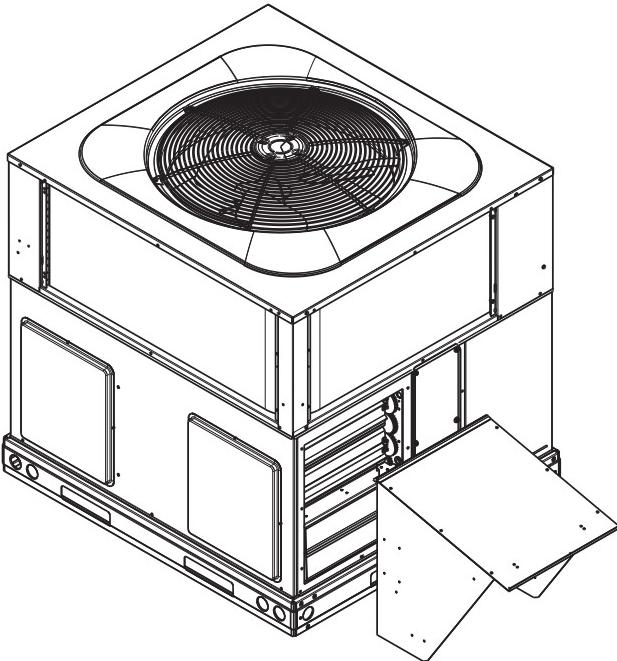
**Fig. 32 - Filter Angle Bracket Installation**

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**Fig. 33 - Hood Assembly**



A09701

**Fig. 34 - Economizer Hood Installation**

11. Open the filter clips on the inside of the hood top. Insert the aluminum filter into the hood and close the clips to hold in place. See Fig. 35.
12. To replace air filters, open filter access door remove old filters and install new disposable filters in filter rack. See Table 14 for filter part numbers.

**IMPORTANT:** On the the bent coil (See Fig. 36 to determine coil type) filter rack, the 18 x 24 x 1 (257.2mm x 609.6mm x25.4mm) filter must be installed through the filter access door first then install the 16 x 24 x 1 (406.4mm x 609.6mm x 25.4mm) filter.

**NOTE:** The economizer control settings and the filters are accessible through the filter access door.

**Table 14 – Filter Part Number**

DESCRIPTION		PART NUMBER
Straight Indoor Coil Air Filter	14 x 24 x 1 (355.6 x 609.6 x 25.4 mm)	KH01AA314
	16 x 24 x 1 (406.4 x 609.6 x 25.4 mm)	KH01AA316
Bent Indoor Coil Air Filter	16 x 24 x 1 (406.4 x 609.6 x 25.4 mm)	KH01AA316
	18 x 24 x 1 (457.2 x 609.5 x 25.4 mm)	KH01AA318

13. Economizer controls are set to a standard factory setting. Nevertheless, you can adjust these settings through the filter access door. Review the settings in the Operation section:
  - (1.) The standard economizer controller has a factory setting of “C” for the outdoor air temperature changeover and 63°F (17°C) for the supply air (mixed air) temperature sensor. The outdoor air temperature changeover setting is adjusted on the sensor by setting the dip switches on the sensor. The ABCD potentiometer on the economizer control should be set to the “D” position.
  - (2.) The low ambient compressor lockout switch setting is fixed at 42°F (5.6°C).
  - (3.) The minimum position for the outdoor air damper can be configured at the controller. When not using a CO<sub>2</sub> sensor, the DCV Max potentiometer must be completely closed (CCS) for the Minimum Position potentiometer to function correctly.
  - (4.) Settings for the optional outdoor enthalpy sensor, indoor enthalpy sensor, and CO<sub>2</sub> sensor can also be configured at the controller.
14. Replace the filter access panel. Screw in place ensuring all seams are air and watertight.
15. Install all economizer accessories then power HVAC unit and test cycle economizer.

## CONFIGURATION

### Economizer Standard Sensors

**OUTDOOR AIR TEMPERATURE (OAT) SENSOR**—The outdoor air temperature sensor (HH57AC080) is a 10 to 20mA device used to measure the outdoor-air temperature. The outdoor-air temperature is used to determine when the Economizer can be used for free cooling. The operating range of temperature measurement is 40 to 100°F (4.4 to 37.8°C). The sensor has 8 selectable temperature changeover setpoints. The temperature changeover is set using 3 dip switches on the sensor. The ABCD potentiometer on the controller should be set to the “D” position. See Fig. 39.

**SUPPLY AIR TEMPERATURE (SAT) SENSOR**—The supply air temperature sensor is a 3 KΩ thermistor located at the inlet of the indoor fan. See Fig. 37. The operating range of temperature measurement is 0° to 158°F (-17.8° to 70°C). See Table 15 for sensor temperature/resistance values. The temperature sensor looks like an eyelet terminal with wires running to it. The sensor is located in the “crimp end” and is sealed from moisture.

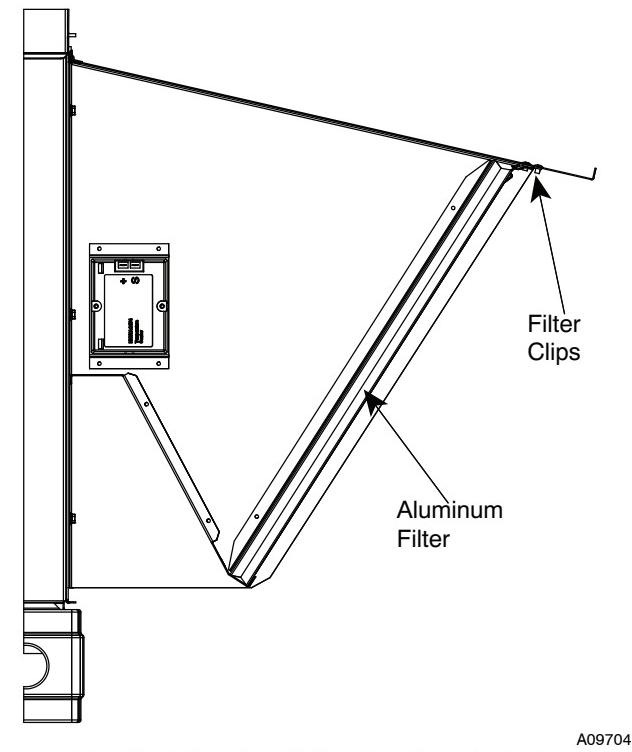


Fig. 35 – Filter Installation (See through view)

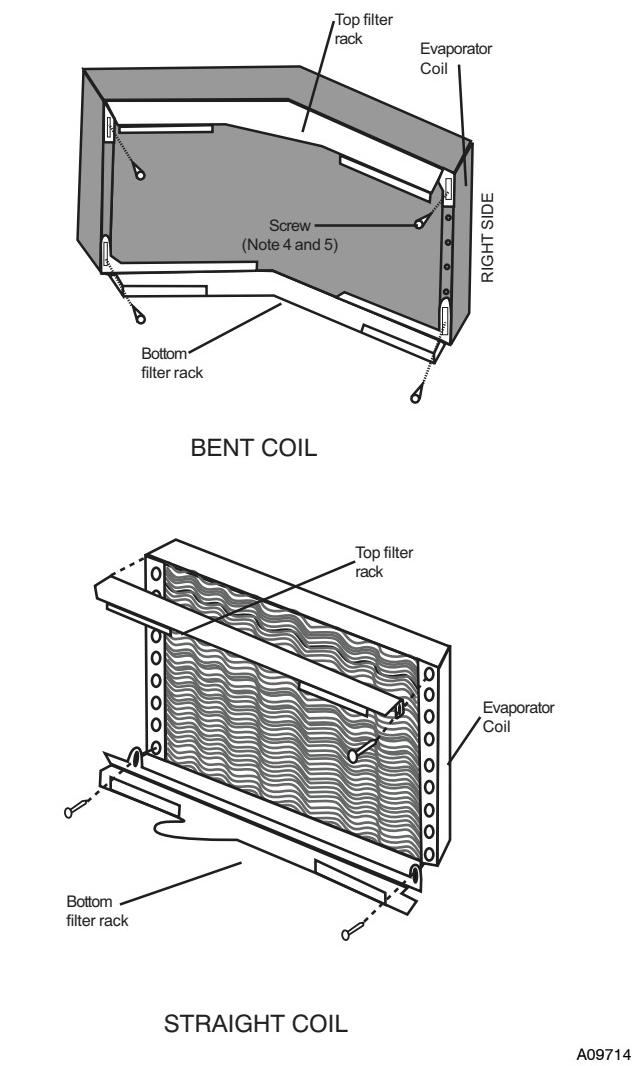


Fig. 36 – Indoor Coil with Filter Rack

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Table 15 – Supply Air Sensor Temperature/Resistance Values

TEMPERATURE (°F)	CELSIUS (°C)	RESISTANCE (OHMS)
-22	-30	53,010
-4	-20	29,091
14	-10	16,590
32	0	9,795
50	10	5,970
68	20	3,747
77	25	3,000
86	30	2,416
104	40	1,597
122	50	1,080
140	60	746
158	70	525

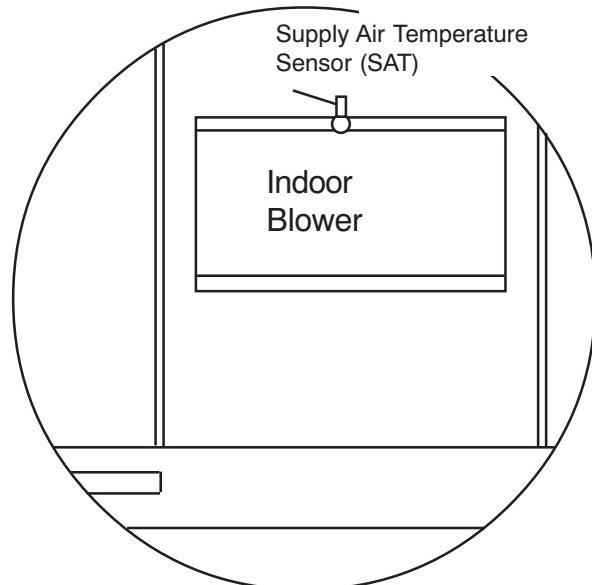


Fig. 37 – SAT Location

**LOW TEMPERATURE COMPRESSOR LOCKOUT SWITCH**—The Economizer is equipped with a low ambient temperature lockout switch located in the outdoor airstream which is used to lock out the compressors below a 42°F (5.6°C) ambient temperature.

**Economizer Control Modes**—Determine the Economizer control mode before set up of the control. Some modes of operation may require different sensors. Refer to Table 11. The Economizer is supplied from the factory with a supply air temperature sensor, a low temperature compressor lockout switch, and an outdoor air temperature sensor. This allows for operation of the Economizer with outdoor air dry bulb changeover control. Additional accessories can be added to allow for different types of changeover control and operation of the Economizer and unit.

**OUTDOOR DRY BULB CHANGEOVER**—The standard controller is shipped from the factory configured for outdoor dry bulb changeover control. The outdoor air and supply air temperature sensors are included as standard.

For this control mode, the outdoor temperature is compared to a selectable set point on the sensor. See Fig. 39. If the outdoor-air temperature is above the set point, the Economizer will adjust the outdoor air dampers to minimum position. If the outdoor-air temperature is below the set point, the position of the outdoor-air dampers will be controlled to provide free cooling using outdoor air. When in this mode, the LED next to the free cooling set point potentiometer will be on. The changeover temperature set point is set using the switches on the sensor. See Fig. 39 for the corresponding temperature changeover values.

In this mode of operation, the outdoor-air temperature is compared to the return-air temperature and the lower temperature airstream is used for cooling. When using this mode of changeover control, turn the free cooling/enthalpy set point potentiometer fully clockwise to the D setting. See Fig. 38 and Fig. 43.

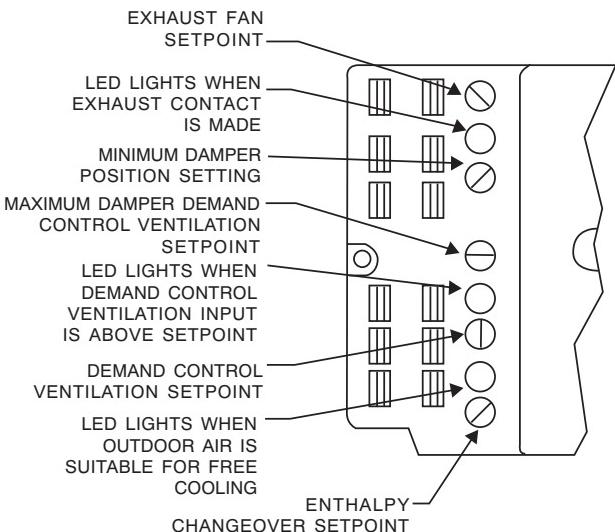


Fig. 38 - Economizer Controller Potentiometer and LED Locations

DIP SWITCH POSITION	CHANGEOVER TEMPERATURE
---------------------	------------------------

DIP SWITCH POSITION	CHANGEOVER TEMPERATURE
ON OFF 1 2 3	48°F (8.9°C)
ON OFF 1 2 3	53°F (11.7°C)
ON OFF 1 2 3	55°F (12.8°C)
ON OFF 1 2 3	58°F (14.4°C)
ON OFF 1 2 3	63°F (17.2°C)
ON OFF 1 2 3	68°F (20°C)
ON OFF 1 2 3	73°F (22.8°C)
ON OFF 1 2 3	78°F (25.6°C)
	M27636

A10134

Fig. 39 - Outdoor Air Temperature Changeover Set Points

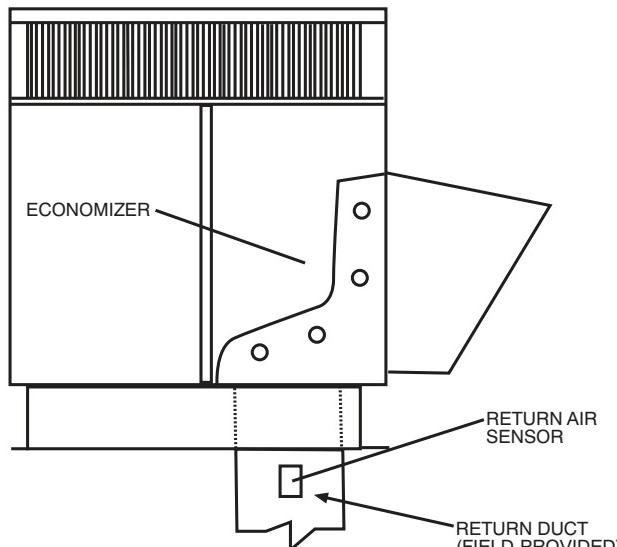


Fig. 40 - Enthalpy Sensor Mounting Location

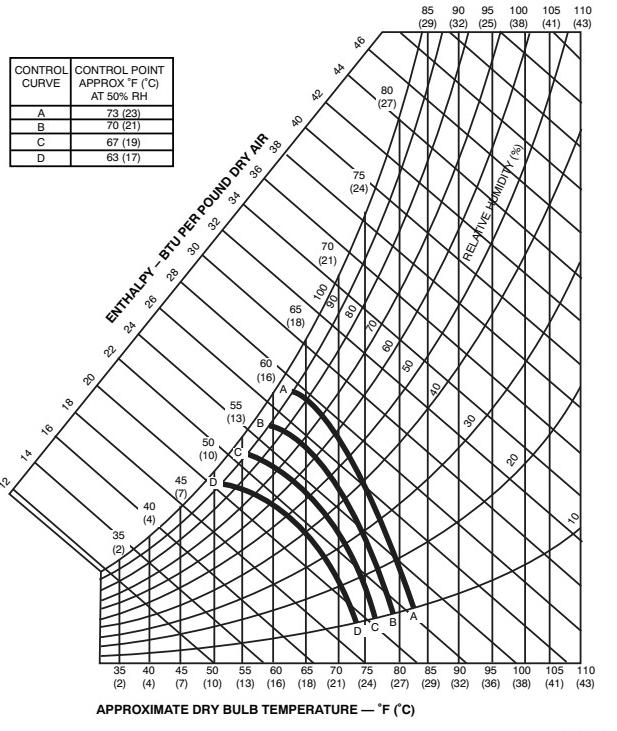


Fig. 41 - Enthalpy Changeover Setpoints

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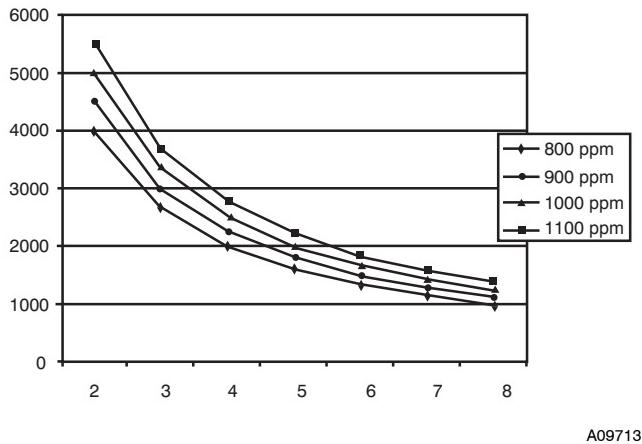


Fig. 42 - CO<sub>2</sub> Sensor Maximum Range Setting

**OUTDOOR ENTHALPY CHANGEOVER**—For enthalpy control, accessory enthalpy sensor (part number HH57AC078) is required. Replace the standard outdoor dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. When the outdoor air enthalpy rises above the outdoor enthalpy changeover set point, the outdoor-air damper moves to its minimum position. The outdoor enthalpy changeover set point is set with the outdoor enthalpy set point potentiometer on the Economizer controller. The set points are A, B, C, and D. See Fig. 41. The factory-installed 620-ohm jumper must be in place across terminals SR and SR+ on the Economizer controller. See Fig. 43 and Fig. 44.

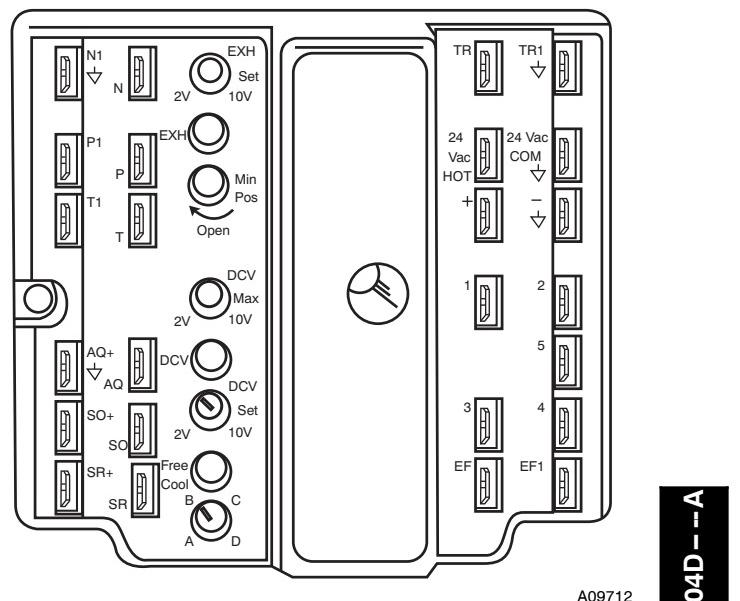


Fig. 43 - Economizer Controller

**DIFFERENTIAL ENTHALPY CONTROL**—For differential enthalpy control, the Economizer controller uses two enthalpy sensors (HH57AC078 and CRENDDIF004A00), one in the outside air and one in the return airstream. The Economizer controller compares the outdoor air enthalpy to the return air enthalpy to determine Economizer use. The controller selects the lower enthalpy air (return or outdoor) for cooling. For example, when the outdoor air has a lower enthalpy than the return air and is below the set point, the Economizer opens to bring in outdoor air for free cooling. Replace the standard outside air dry bulb temperature sensor with the accessory enthalpy sensor in the same mounting location. Mount the return air enthalpy sensor in the return air duct. See Fig. 40. When using this mode of changeover control, turn the enthalpy set point potentiometer fully clockwise to the D setting.

**INDOOR AIR QUALITY (IAQ) SENSOR INPUT**—The IAQ input can be used for demand control ventilation control based on the level of CO<sub>2</sub> measured in the space or return air duct. Mount the accessory IAQ sensor according to manufacturer specifications. The IAQ sensor should be wired to the AQ and AQ1 terminals of the controller. Adjust the DCV potentiometers to correspond to the DCV voltage output of the indoor air quality sensor at the user determined set point. See Fig. 42. If a separate field-supplied transformer is used to power the IAQ sensor, the sensor must not be grounded or the Economizer control board will be damaged.

**EXHAUST SET POINT ADJUSTMENT**—The exhaust set point will determine when the exhaust fan runs based on damper position (if power exhaust is installed). The set point is modified with the Exhaust Fan Set Point (EXH SET) potentiometer. See Fig. 44 for Wiring Diagram. The set point represents the damper position above which the exhaust fans will be turned on. When there is a call for exhaust, the Economizer controller provides a 45 ± 15 second delay before exhaust fan activation to allow the dampers to open. This delay allows the damper to reach the appropriate position to avoid unnecessary fan overload.

**MINIMUM POSITION CONTROL**—There is a minimum damper position potentiometer on the Economizer controller. See Fig. 38 and 44. The minimum damper position maintains the minimum airflow into the building during the occupied period. When using demand ventilation, the minimum damper position represents the minimum ventilation position for VOC (volatile organic compound) ventilation requirements. The DCV Max potentiometer must be fully closed (CCW) to allow the Minimum Position potentiometer to function correctly.

When demand ventilation control is not being used, the minimum position potentiometer should be used to set the occupied ventilation position. The maximum demand ventilation position should be turned fully clockwise. Adjust the minimum position potentiometer to allow the minimum amount of outdoor air, as required by local codes, to enter the building. Make minimum position adjustments with at least 10°F (12.2°C) temperature difference between the outdoor and return-air temperatures. To determine the minimum position setting, perform the following procedure:

1. Calculate the appropriate mixed air temperature using the following formula:

$$(T_o \times OA/100) + (T_R \times RA/100) = T_M$$

$T_o$  = Outdoor-Air Temperature

$OA$  = Percent of Outdoor Air

$T_R$  = Return-Air Temperature

$RA$  = Percent of Return Air

$T_M$  = Mixed-Air Temperature

As an example, if local codes require 10% outdoor air during occupied conditions, outdoor-air temperature is 60°F (15.6°C), and return-air temperature is 75°F (23.9°C).  $(60 \times .10) + (75 \times .90) = 73.5°F (23.1°C)$

2. Disconnect the supply air sensor from terminals T and T1.
3. Ensure that the factory-installed jumper is in place across terminals P and P1. If remote damper positioning is being used, make sure that the terminals are wired according to Fig. 44 and that the minimum position potentiometer is turned fully clockwise.
4. Connect 24 vac across terminals TR and TR1.
5. Carefully adjust the minimum position potentiometer until the measured mixed-air temperature matches the calculated value.
6. Reconnect the supply air sensor to terminals T and T1.

Remote control of the Economizer damper is desirable when requiring additional temporary ventilation. If a field-supplied remote potentiometer (Honeywell part number S963B1128) is wired to the Economizer controller, the minimum position of the damper can be controlled from a remote location. To control the minimum damper position remotely, remove the factory installed jumper on the P and P1 terminals on the Economizer controller. Wire the field-supplied potentiometer to the P and P1 terminals on the Economizer controller. See Fig. 43 and Fig. 44.

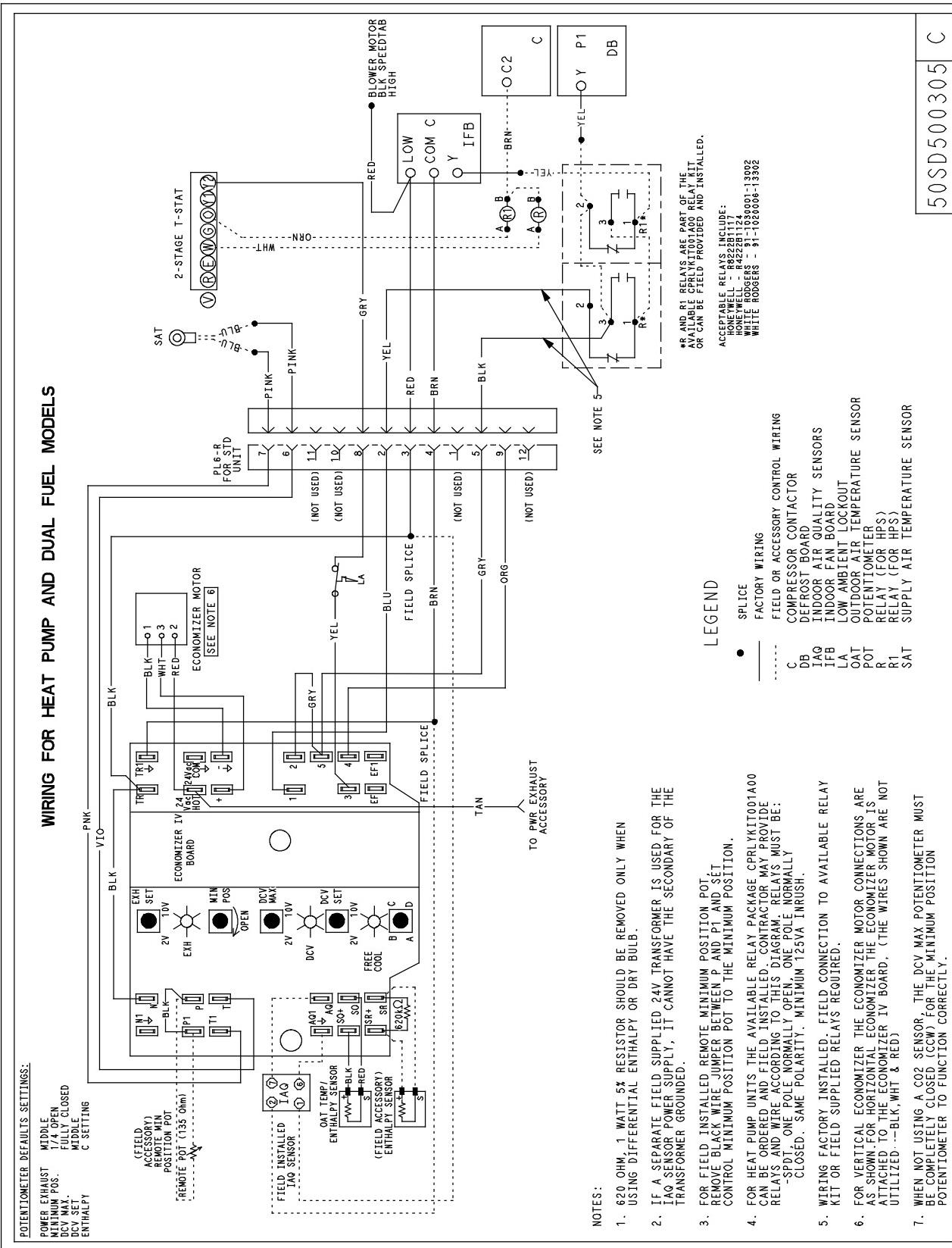


Fig. 44 - Economizer Wiring Diagram

A10059

# CONNECTION WIRING DIAGRAM

## DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

- NOTES:**
1. IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH THE SAME WIRE OR ITS EQUIVALENT.
  2. SEE PRICE PAGES FOR THERMOSTATS.
  3. USE 75 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
  4. SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT. INDOOR FAN MOTOR PLUGS - DO NOT DISCONNECT UNDER LOAD.
  5. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003.
  6. REMOVE YELLOW SPLICE WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED AND CONNECT TO RELAY R1 AS SHOWN.
  7. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, CONNECT THE YELLOW AND BLACK WIRES TO RELAY "R" AS SHOWN. RELAY KIT REQUIRED WITH ECONOMIZER AND HEAT PUMP/DUAL FUEL UNITS.
  8. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, INSTALL WIRES AS SHOWN ON THE COILS OF RELAY R AND RELAY R1.
  9. DEHUM FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED. UNIT FACTORY-SHIPPED IN STD MODE.

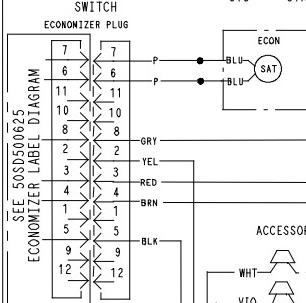
SCHEMATIC  
208/230-3-60

### COLOR CODE

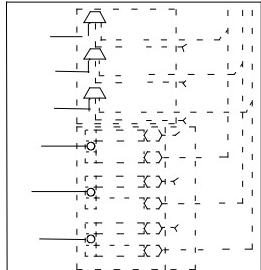
BLK	BLACK
BLU	BLUE
BRN	BROWN
GRY	GRAY
GRN	GREEN
ORN	ORANGE
PNK	PINK
RED	RED
VIO	VIOLET
WHT	WHITE
YEL	YELLOW

### LEGEND

□	FIELD SPLICE
○	TERMINAL (MARKED)
○	TERMINAL (UNMARKED)
●	SPLICING (IF REQ'D)
□	SPLICE (MARKED)
—	FACTORY WIRING
—	FIELD CONTROL WIRING
—	FIELD POWER WIRING
---	ACCESSORY OR OPTIONAL WIRING
AT	AUTO TRANSFORMER
C	CONTACTOR
CCH	CRANK CASE HEATER
COMP	COMPRESSOR MOTOR
DB	DEFROST BOARD
DFT	DEFROST TEMPERATURE SWITCH
ECON	DEHUMIDIFICATION MODE
EQUP	EQUIPMENT
FU	FUSE
HPS	HIGH PRESSURE SWITCH
HR	HEATER RELAY
IFB	INDOOR FAN BOARD
IFM	INDOOR FAN MOTOR
LPS	LOW PRESSURE SWITCH
OFM	OUTDOOR FAN MOTOR
OFR	OUTDOOR FAN RELAY
RVS	REVERSING VALVE
TRAN	TRANSFORMER
T-STAT	THERMOSTAT
R	ECON RELAY
STD	STANDARD MODE

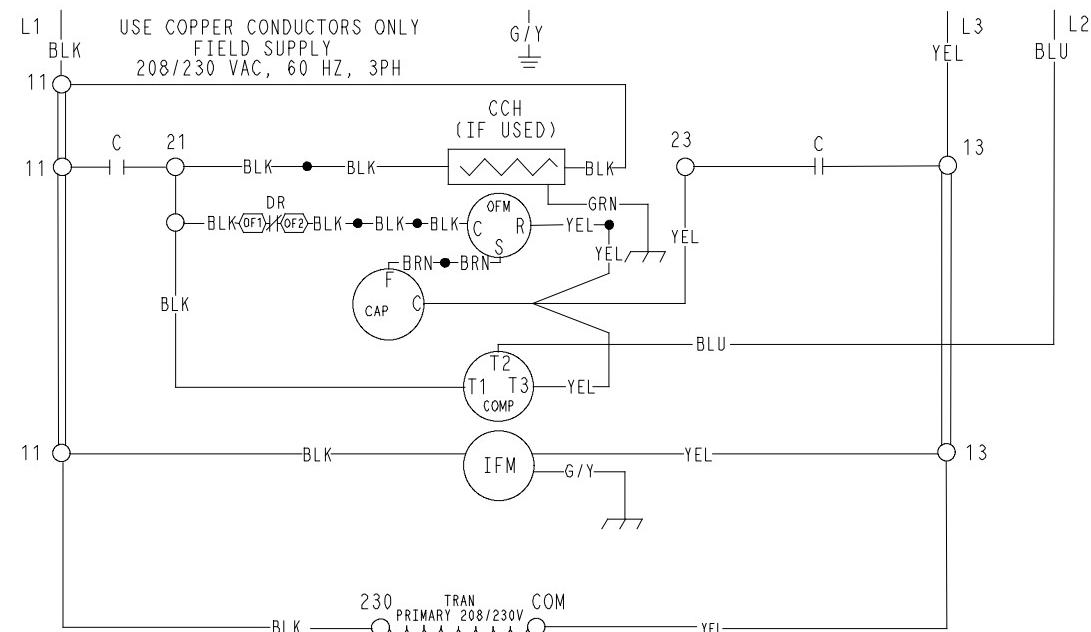


FOR WIRING WITH  
ELECTRIC HEATERS  
SEE SCHEMATIC ON  
HEATER ACCESSORY.

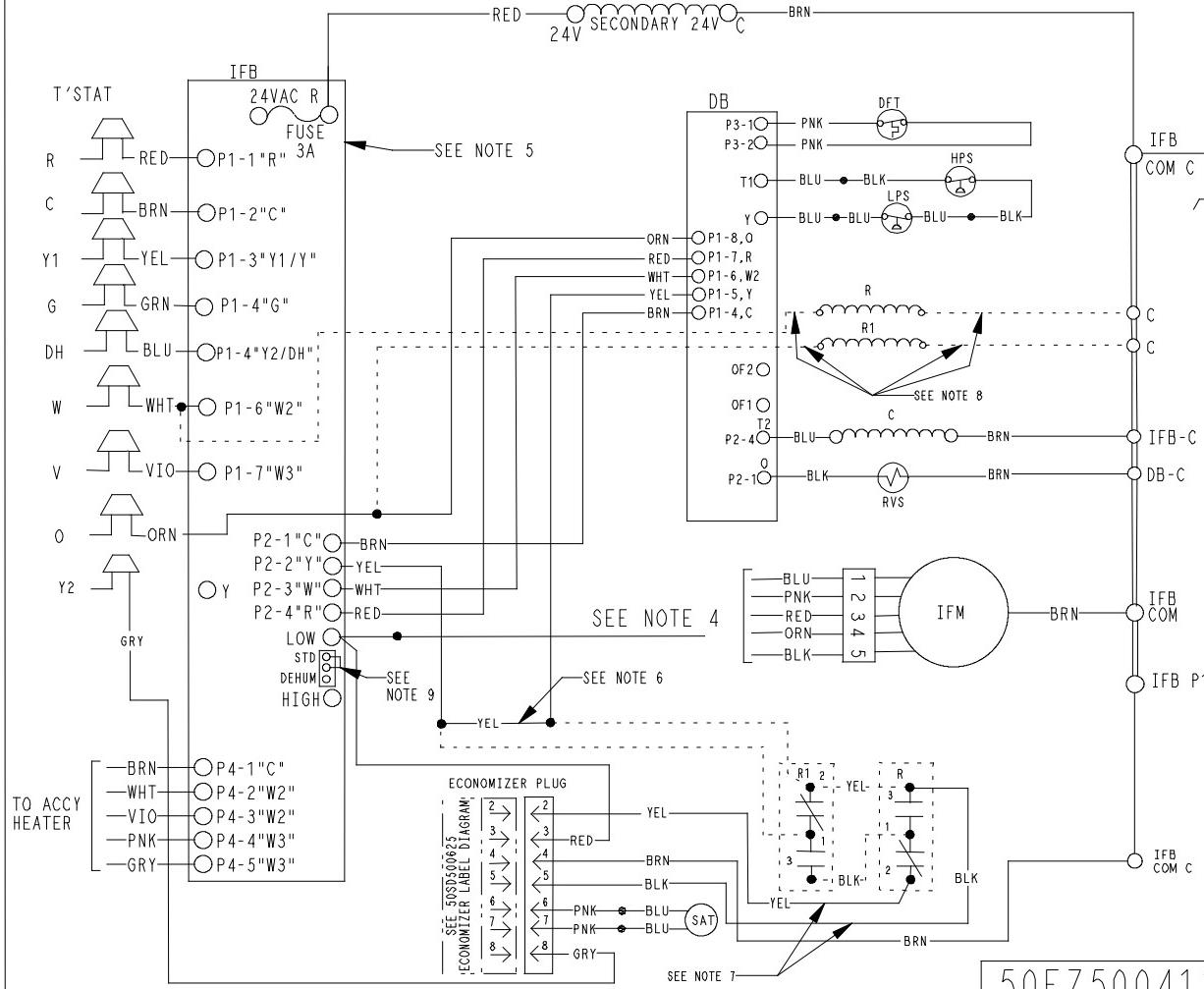


## LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



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50EZ500412

A10200

**Fig. 45 Cont. - Ladder Wiring Diagram 230-3**

# CONNECTION WIRING DIAGRAM

## DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING

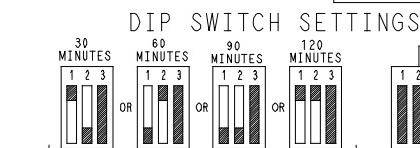
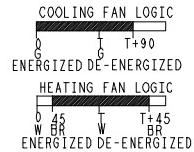
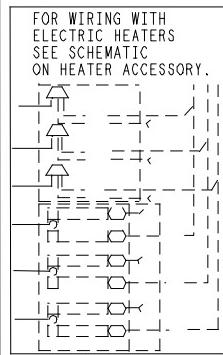
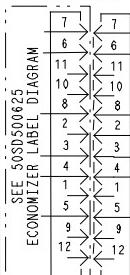
SCHEMATIC  
460-3-60

- NOTES:
1. IF ANY OF THE ORIGINAL WIRES FURNISHED ARE REPLACED, THEY MUST BE REPLACED WITH THE SAME WIRE OR ITS EQUIVALENT.
  2. SEE PRICE PAGES FOR THERMOSTATS.
  3. USE 75 DEG. COPPER CONDUCTORS FOR FIELD INSTALLATION.
  4. SEE INSTALLATION INSTRUCTIONS FOR PROPER HEATING AND COOLING CONNECTIONS FOR YOUR UNIT. INDOOR FAN MOTOR PLUGS - "DO NOT DISCONNECT UNDER LOAD".
  5. THESE FUSES ARE MANUFACTURED BY COOPER BUSSMANN, P/N FNG-R-5.
  6. THIS FUSE IS MANUFACTURED BY LITTELFUSE, P/N 257003.
  7. REMOVE YELLOW SPLICE WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED AND CONNECT TO RELAY R1 AS SHOWN.
  8. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, CONNECT THE YELLOW AND BLACK WIRES TO RELAY "R" AS SHOWN. RELAY KIT REQUIRED WITH ECONOMIZER AND HEAT PUMP/DUAL FUEL UNITS.
  9. WHEN ECONOMIZER AND ECONOMIZER RELAYS ARE USED, INSTALL WIRES AS SHOWN ONTO THE COILS OF RELAY R AND RELAY R1.
  10. DEHUM FEATURE CANNOT BE USED WHEN ECONOMIZER IS INSTALLED. UNIT FACTORY-SHIPPED IN STD MODE.

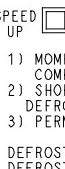
### LEGEND

△	FIELD SPLICE	DH	DEHUMIDIFICATION MODE
□	TERMINAL (MARKED)	DR	DEFROST RELAY
○	TERMINAL (UNMARKED)	ECON	ECONOMIZER
●	SPLICE (IF REQ'D)	EQUIP	EQUIPMENT
□	SPLICE (MARKED)	FU	FUSE
—	FACTORY WIRING	GND	GROUND
—	FIELD CONTROL WIRING	HPS	HIGH PRESSURE SWITCH
—	FIELD POWER WIRING	HR	HEATER RELAY
—	ACCESSORY OR OPTIONAL	IFB	INDOOR FAN BOARD
—	WIRING	IFM	INDOOR FAN MOTOR
AT	AUTO TRANSFORMER	LPS	LOW PRESSURE SWITCH
C	CONTACTOR	OFM	OUTDOOR FAN MOTOR
CAP 1	CAPACITOR, COMP	OFR	OUTDOOR FAN RELAY
CCH	CRANK CASE HEATER	RVS	REVERSING VALVE
COMP	COMPRESSOR MOTOR	TRAN	TRANSFORMER
DB	DEFROST BOARD	T-STAT	TERMOSTAT
DFT	DEFROST TEMPERATURE	R	ECON RELAY
	SWITCH	R1	ECON RELAY, STANDARD MODE
		STD	

### ECONOMIZER PLUG



FIELD SELECTABLE OPTIONS FOR TIME PERIOD BETWEEN DEFROST CYCLES (MINUTES)



- 1) MOMENTARILY SHORT PINS AND RELEASE TO BYPASS COMPRESSOR OFF DELAY.
- 2) SHORT FOR 5+ SEC. AND RELEASE FOR FORCED DEFROST.
- 3) PERMANENT SHORT WILL BE IGNORED.

DEFROST WILL TERMINATE IN 30 SEC. IF DFT OPEN.  
DEFROST WILL TERMINATE NORMALLY IF DFT IS CLOSED.

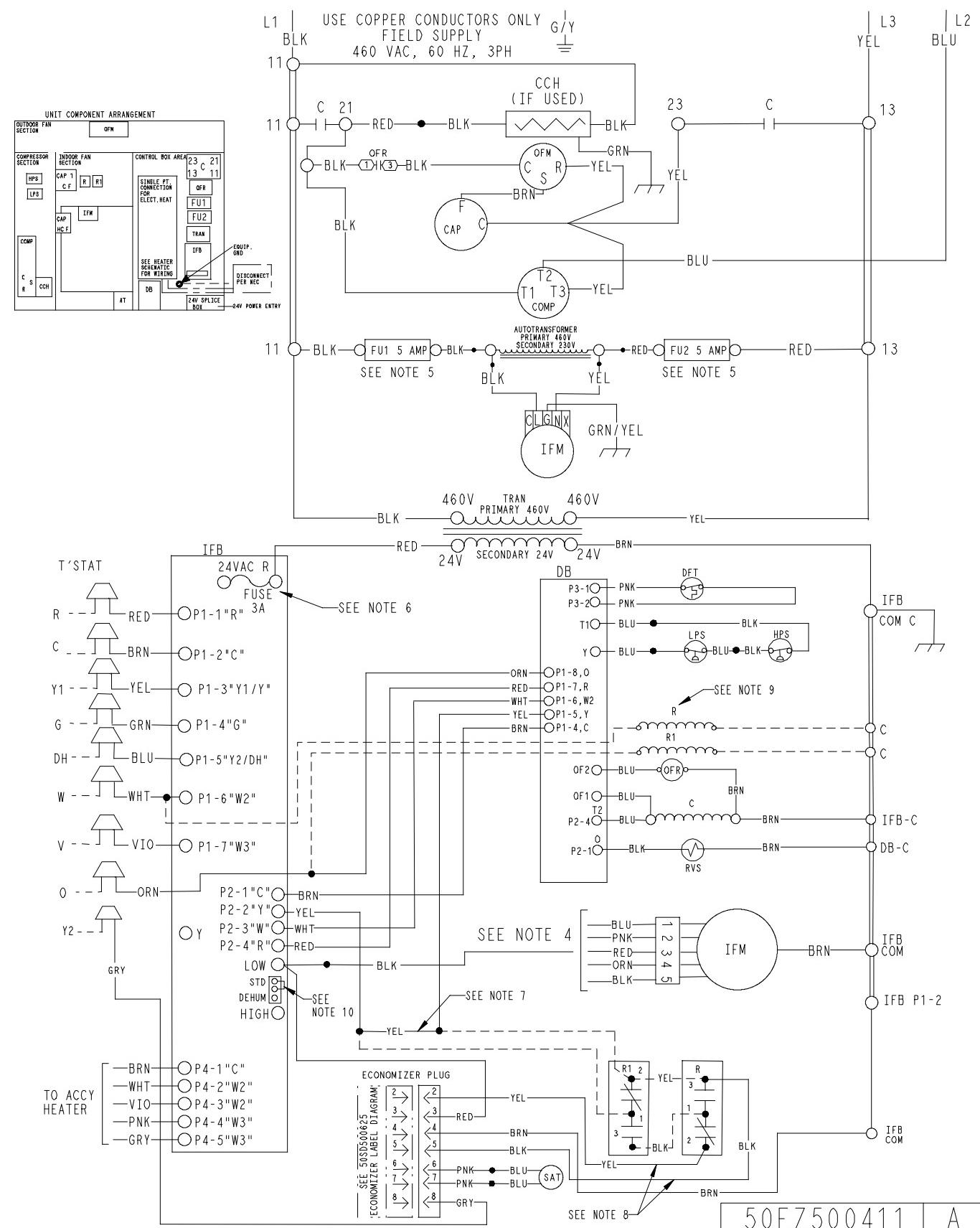
THE COMPRESSOR WILL SHUT OFF FOR 30 SEC. ON DEFROST INITIATION AND TERMINATION IN THE "QUIET SHIFT" ON POSITION

Fig. 46 - Connection Wiring Diagram 460-3

A10199

## LADDER WIRING DIAGRAM

DANGER: ELECTRICAL SHOCK HAZARD DISCONNECT POWER BEFORE SERVICING



**Fig. 46 Cont. - Ladder Wiring Diagram 460-3**

**DAMPER MOVEMENT**—Damper movement from full open to full closed (or vice versa) takes 2 1/2 minutes.

**THERMOSTATS**—The Economizer control works with conventional thermostats that have a Y1 (cool stage 1), Y2 (cool stage 2), W1 (heat stage 1), W2 (heat stage 2), and G (fan). The Economizer control does not support space temperature sensors. Connections are made at the thermostat terminal connection board located in the main control box.

**OCCUPANCY CONTROL**—The factory default configuration for the Economizer control is occupied mode. Occupied status is provided by the black jumper from terminal TR to terminal N. When unoccupied mode is desired, install a field supplied time clock function in place of the jumper between TR and N. See Fig. 44. When the time clock contacts are closed, the Economizer control will be in occupied mode. When the time clock contacts are open (removing the 24-v signal from terminal N), the Economizer will be in unoccupied mode.

**DEMAND CONTROLLED VENTILATION (DCV)**—When using the Economizer for demand controlled ventilation, there are some equipment selection criteria which should be considered. When selecting the heat capacity and cool capacity of the equipment, the maximum ventilation rate must be evaluated for design conditions. The maximum damper position must be calculated to provide the desired fresh air. Typically the maximum ventilation rate will be about 5 to 10% more than the typical CFM required per person, using normal outside air design criteria. An exponential anticipatory strategy should be taken with the following conditions: a zone with a large area, varied occupancy, and equipment that cannot exceed the required ventilation rate at design conditions. Exceeding the required ventilation rate means the equipment can condition air at a maximum ventilation rate that is greater than the required ventilation rate for maximum occupancy. An exponential-anticipatory strategy will cause the fresh air supplied to increase as the room CO<sub>2</sub> level increases even though the CO<sub>2</sub> set point has not been reached. By the time the CO<sub>2</sub> level reaches the set point, the damper will be at maximum ventilation and should maintain the set point. In order to have the CO<sub>2</sub> sensor control the economizer damper in this manner, first determine the damper voltage output for minimum or base ventilation. Base ventilation is the ventilation required to remove contaminants during unoccupied periods. The following equation may be used to determine the percent of outside-air entering the building for a given damper position. For best results there should be at least a 10°F (12.2°C) difference in outside and return-air temperatures.

$$(T_O \times OA/100) + (T_R \times RA/100) = T_M$$

T<sub>O</sub> = Outdoor-Air Temperature

OA = Percent of Outdoor Air

T<sub>R</sub> = Return-Air Temperature

RA = Percent of Return Air

T<sub>M</sub> = Mixed-Air Temperature

Once base ventilation has been determined, set the minimum damper position potentiometer to the correct position. The same equation can be used to determine the occupied or maximum ventilation rate to the building. For example, an output of 3.6 volts to the actuator provides a base ventilation rate of 5% and an output of 6.7 volts provides the maximum ventilation rate of 20% (or base plus 15 CFM per person). Use Fig. 42 to determine the maximum setting of the CO<sub>2</sub> sensor. For example, a 1100 ppm set point relates to a 15 CFM per person design. Use the 1100 ppm curve on Fig. 42 to find the point when the CO<sub>2</sub> sensor output will be 6.7 volts. Line up the point on the graph with the left side of the chart to determine that the range configuration for the CO<sub>2</sub> sensor should be 1800 ppm. The Economizer controller will output the 6.7 volts from the CO<sub>2</sub> sensor to the actuator when the CO<sub>2</sub> concentration in the space is at 1100 ppm.

The DCV set point may be left at 2 volts since the CO<sub>2</sub> sensor voltage will be ignored by the Economizer controller until it rises above the 3.6 volt setting of the minimum position potentiometer. Once the fully occupied damper position has been determined, set the maximum damper demand control ventilation potentiometer to this position. Do not set to the maximum position as this can result in over ventilation to the space and potential high-humidity levels.

**CO<sub>2</sub> SENSOR CONFIGURATION**—The CO<sub>2</sub> sensor has preset standard voltage settings that can be selected anytime after the sensor is powered up. Use setting 1 or 2 for equipment. See Table 16.

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to select the preset number. See Table 16.
4. Press Enter to lock in the selection.
5. Press Mode to exit and resume normal operation.

The custom settings of the CO<sub>2</sub> sensor can be changed anytime after the sensor is energized. Follow the steps below to change the nonstandard settings:

1. Press Clear and Mode buttons. Hold at least 5 seconds until the sensor enters the Edit mode.
2. Press Mode twice. The STDSET Menu will appear.
3. Use the Up/Down button to toggle to the NONSTD menu and press Enter.
4. Use the Up/Down button to toggle through each of the nine variables, starting with Altitude, until the desired setting is reached.
5. Press Mode to move through the variables.
6. Press Enter to lock in the selection, then press Mode to continue to the next variable.

**DEHUMIDIFICATION OF FRESH AIR WITH DCV CONTROL**—Information from ASHRAE indicates that the largest humidity load on any zone is the fresh air introduced. For some applications, an energy recovery unit can be added to reduce the moisture content of the fresh air being brought into the building when the enthalpy is high. In most cases, the normal heating and cooling processes are more than adequate to remove the humidity loads for most commercial applications.

If normal rooftop heating and cooling operation is not adequate for the outdoor humidity level, an energy recovery unit and/or a dehumidification option should be considered.

Table 16 – CO<sub>2</sub> Sensor Standard Settings

SETTING	EQUIPMENT	OUTPUT	VENTILATION RATE (CFM/ PERSON)	ANALOG OUTPUT	CO <sub>2</sub> CONTROL RANGE (PPM)	OPTIONAL RELAY SETPOINT (PPM)	RELAY HYSTERESIS (PPM)
1		Proportional	Any	0–10V 4–20mA	0–2000	1000	50
2	Interface w/Standard Building Control System	Proportional	Any	2–10V 7–20mA	0–2000	1000	50
3		Exponential	Any	0–10V 4–20mA	0–2000	1100	50
4		Proportional	15	0–10V 4–20mA	0–1100	1100	50
5	Economizer	Proportional	20	0–10V 4–20mA	0–900	900	50
6		Exponential	15	0–10V 4–20mA	1–1100	1100	50
7		Exponential	20	0–10V 4–20mA	0–900	900	50
8	Health & Safety	Proportional	–	0–10V 4–20mA	0–9999	5000	500
9	Parking/Air Intakes/Loading Docks	Proportional	–	0–10V 4–20mA	0–2000	700	50

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Table 17 – CO<sub>2</sub> Sensor Standard Settings Economizer Input/Output Logic

INPUTS				OUTPUTS				
DEMAND CONTROL VENTILATION (DCV)	ENTHALPY		Y1	COMPRESSOR		N TERMINAL		
	OUTDOOR	RETURN		Y2	STAGE 1	STAGE 2	OCCUPIED	
					STAGE 1	STAGE 2	UNOCCUPIED	
Below set (DCV LED Off)	High (Free Cooling LED off)	Low	On	On	On	On	Minimum position	Closed
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED on)	High	On	On	On	Off	Modulating** (between min. position and full-open)	Modulating** (between closed and full-open)
			On	Off	Off	Off		
			Off	Off	Off	Off	Minimum position	Closed
Above set (DCV LED On)	High (Free Cooling LED off)	Low	On	On	On	On	Modulating†† (between min. position and DCV maximum)	Modulating†† (between closed and DCV maximum)
			On	Off	On	Off		
			Off	Off	Off	Off		
	Low (Free Cooling LED on)	High	On	On	On	Off	Modulating***	Modulating†††
			On	Off	Off	Off		
			Off	Off	Off	Off		

\* For single enthalpy control, the module compares outdoor enthalpy to the ABCD set point.

† Power at N terminal determines Occupied/Unoccupied setting: 24 vac (Occupied), now power (Unoccupied).

\*\*Modulating is based on the supply-air sensor signal.

††Modulation is based on the DCV signal.

\*\*\*Modulation is based on the greater of DCV and supply-air sensor signals, between minimum position and either maximum position (DCV) or fully open (supply-air signal).

†††Modulating is based on the greater of DCV and supply-air sensor signals, between closed and either maximum position (DCV) or fully open (supply-air signal).

## OPERATION

**Sequence of Operation**—When free cooling is not available, the compressor will be controlled by the thermostat. When free cooling is available, the outdoor-air damper is modulated by the Economizer control to provide a 50° to 55°F (10° to 12.8°C) supply-air temperature into the zone. As the supply-air temperature fluctuates above 55° (12.8°C) or below 50°F (10°C), the dampers will be modulated (open or close) to bring the supply-air temperature back within the set points. For Economizer operation, there must be a thermostat call for the fan (G). This will move the damper to its minimum position during the occupied mode.

**NOTE:** The DCV Max potentiometer must be closed (CCW) when not using CO<sub>2</sub> sensor.

Above 50°F (10°C) supply-air temperature, the dampers will modulate from 100% open to the minimum open position. From 50°F to 45°F (10° to 7.2°C) supply-air temperature, the dampers will maintain at the minimum open position. Below 45°F (7.2°C), the dampers will be completely shut. As the supply-air temperature rises, the dampers will come back open to the minimum open position once the supply-air temperature rises to 48°F (8.9°C). If

power exhaust is installed, as the outdoor-air damper opens and closes, the power exhaust fans will be energized and deenergized. If field-installed accessory CO<sub>2</sub> sensors are connected to the Economizer control, a demand controlled ventilation strategy will begin to operate. As the CO<sub>2</sub> level in the zone increases above the CO<sub>2</sub> set point, the minimum position of the damper will be increased proportionally. As the CO<sub>2</sub> level decreases because of the increase in fresh air, the outdoor-air damper will be proportionally closed. Damper position will follow the higher demand condition from DCV mode or free cooling mode. Damper movement from full closed to full open (or vice versa) will take between 1 1/2 and 2 1/2 minutes. If free cooling can be used as determined from the appropriate changeover command (dry bulb, enthalpy curve, or differential enthalpy), a call for cooling (Y1 closes at the thermostat) will cause the control to modulate the dampers open to maintain the supply air temperature set point at 50° to 55°F (10° to 12.8°C). As the supply air temperature drops below the set point range of 50° to 55°F (10° to 12.8°C), the control will modulate the outdoor-air dampers closed to maintain the proper supply-air temperature.

## TROUBLESHOOTING

See Table 17 for Economizer logic. An Economizer simulator program is available to help with Economizer training and troubleshooting.

**Economizer Preparation** —This procedure is used to prepare the Economizer for troubleshooting. No troubleshooting or testing is done by performing the following procedure.

**NOTE:** This procedure requires a 9-v battery, 1.2 kilo-ohm resistor, and a 5.6 kilo-ohm resistor which are not supplied with the Economizer.

1. Disconnect power at TR and TR1. All LEDs should be off. Exhaust fan contacts should be open.
2. Disconnect device at P and P1.
3. Jumper P to P1.
4. Disconnect wires at T and T1. Place 5.6 kilo-ohm resistor across T and T1.
5. Jumper TR to 1.
6. Jumper TR to N.
7. If connected, remove sensor from terminals S<sub>0</sub> and +. Connect 1.2 kilo-ohm 4074EJM checkout resistor across terminals S<sub>0</sub> and +.
8. Put 620-ohm resistor across terminals SR and +.
9. Set minimum position, DCV set point, and exhaust potentiometers fully CCW (counterclockwise).
10. Set DCV maximum position potentiometer fully CW (clockwise).
11. Set enthalpy potentiometer to D.
12. Apply power (24 vac) to terminals TR and TR1.

**Differential Enthalpy** — To check differential enthalpy:

1. Make sure Economizer preparation procedure has been performed.
2. Place 620-ohm resistor across S<sub>0</sub> and +.
3. Place 1.2 kilo-ohm resistor across SR and +. The Free Cool LED should be lit.
4. Remove 620-ohm resistor across S<sub>0</sub> and +. The Free Cool LED should turn off.
5. Return Economizer settings and wiring to normal after completing troubleshooting.

**Single Enthalpy**—To check single enthalpy:

1. Make sure Economizer preparation procedure has been performed.
2. Set the enthalpy potentiometer to A (fully CCW). The Free Cool LED should be lit.
3. Set the enthalpy potentiometer to D (fully CW). The Free Cool LED should turn off.
4. Return Economizer settings and wiring to normal after completing troubleshooting.

### DCV (Demand Controlled Ventilation) and Power

**Exhaust**—To check DCV and Power Exhaust:

1. Make sure Economizer IV preparation procedure has been performed.
2. Ensure terminals AQ and AQ1 are open. The LED for both DCV and Exhaust should be off. The actuator should be fully closed.
3. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The LED for both DCV and Exhaust should turn on. The actuator should drive to between 90 and 95% open.
4. Turn the Exhaust potentiometer CW until the Exhaust LED turns off. The LED should turn off when the potentiometer is approximately 90%. The actuator should remain in position.

5. Turn the DCV set point potentiometer CW until the DCV LED turns off. The DCV LED should turn off when the potentiometer is approximately 9-v. The actuator should drive fully closed.
6. Turn the DCV and Exhaust potentiometers CCW until the Exhaust LED turns on. The exhaust contacts will close 30 to 120 seconds after the Exhaust LED turns on.
7. Return Economizer settings and wiring to normal after completing troubleshooting.

**DCV Minimum and Maximum Position** —To check the DCV minimum and maximum position:

1. Make sure Economizer preparation procedure has been performed.
2. Connect a 9-v battery to AQ (positive node) and AQ1 (negative node). The DCV LED should turn on. The actuator should drive to between 90 and 95% open.
3. Turn the DCV Maximum Position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
4. Turn the DCV Maximum Position potentiometer to fully CCW. The actuator should drive fully closed.
5. Turn the Minimum Position potentiometer to midpoint. The actuator should drive to between 20 and 80% open.
6. Turn the Minimum Position Potentiometer fully CW. The actuator should drive fully open.
7. Remove the jumper from TR and N. The actuator should drive fully closed.
8. Return Economizer settings and wiring to normal after completing troubleshooting.

**Supply-Air Input**—To check supply-air input:

1. Make sure Economizer preparation procedure has been performed.
2. Set the Enthalpy potentiometer to A. The Free Cool LED turns on. The actuator should drive to between 20 and 80% open.
3. Remove the 5.6 kilo-ohm resistor and jumper T to T1. The actuator should drive fully open.
4. Remove the jumper across T and T1. The actuator should drive fully closed.
5. Return Economizer settings and wiring to normal after completing troubleshooting.

**Economizer Troubleshooting Completion** —This procedure is used to return the Economizer to operation. No troubleshooting or testing is done by performing the following procedure.

1. Disconnect power at TR and TR1.
2. Set enthalpy potentiometer to previous setting.
3. Set DCV maximum position potentiometer to previous setting. Set DVC Max potentiometer to fully closed (CCW) when not using a CO<sub>2</sub> sensor.
4. Set minimum position, DCV set point, and exhaust potentiometers to previous settings.
5. Remove 620-ohm resistor from terminals SR and +.
6. Remove 1.2 kilo-ohm checkout resistor from terminals S<sub>0</sub> and +. If used, reconnect sensor from terminals S<sub>0</sub> and +.
7. Remove jumper from TR to N.
8. Remove jumper from TR to 1.
9. Remove 5.6 kilo-ohm resistor from T and T1. Reconnect wires at T and T1.
10. Remove jumper from P to P1. Reconnect device at P and P1.
11. Apply power (24 vac) to terminals TR and TR1.

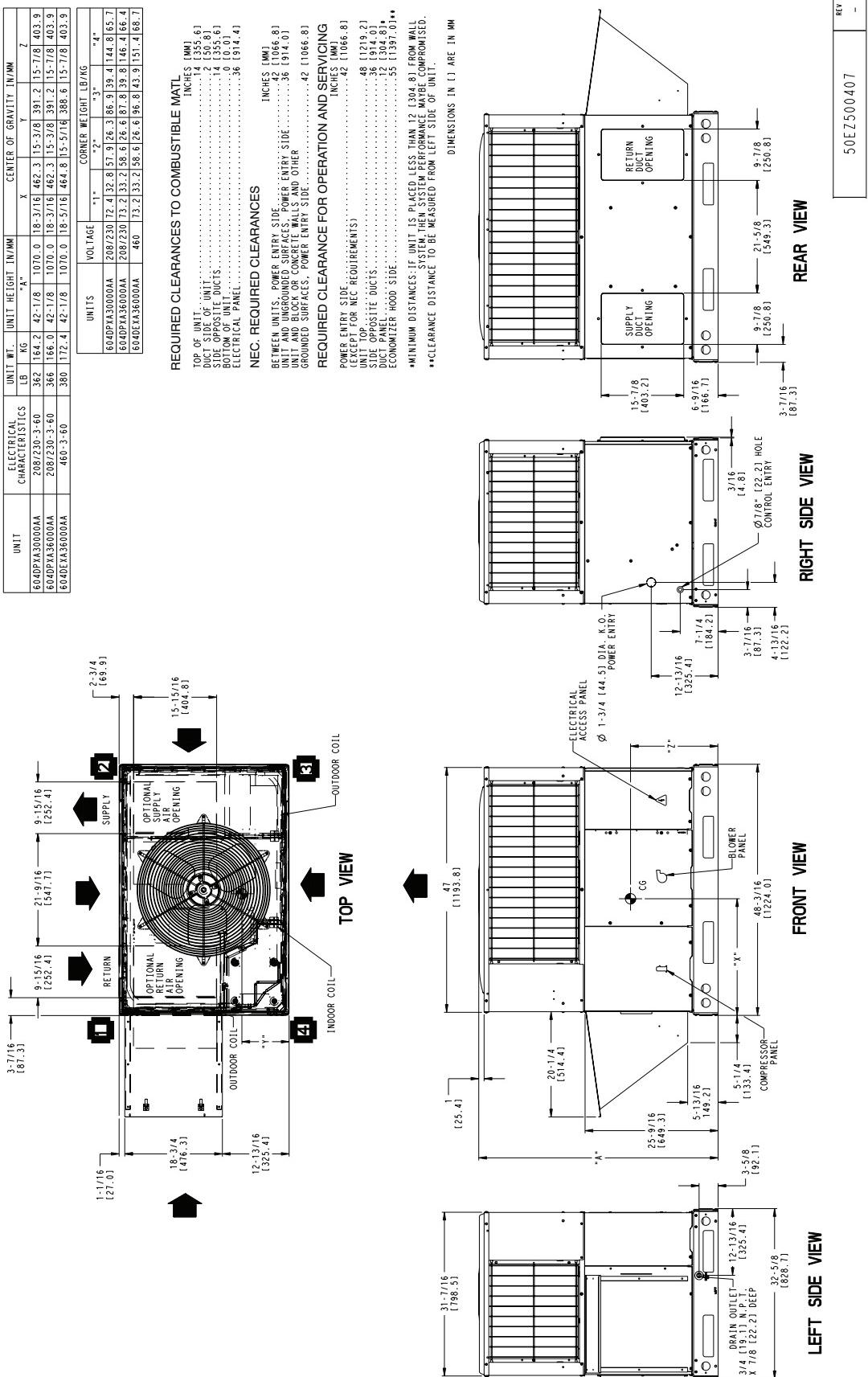


Fig. 47 - 604D--A 30-36 3 Phase with Economizer

A10226

**604D--A**

50E500407

REV

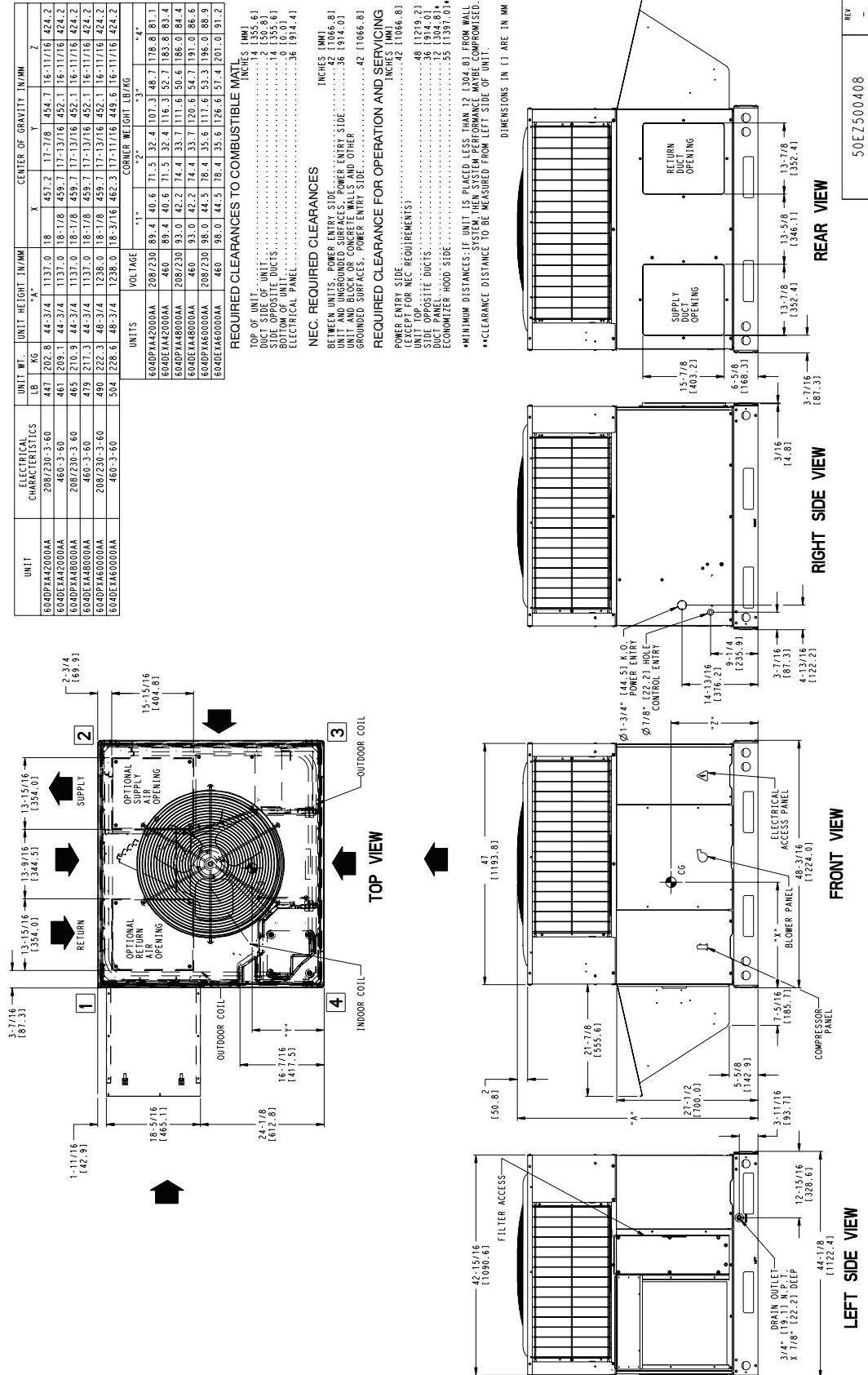


Fig. 48 - 604D--A 42-60 3 Phase with Economizer

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